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Spatial patterns of milk consumption in the Soviet Union, 1985 and 1989.

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"SPATIAL PATTERNS OF MILK CONSUMPTION IN THE SOVIET UNION, 1985 AND 1989"

by

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ABSTRACT

Spatial Patterns of Milk Consumption
in the Soviet Union, 1985 and 1988

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This study focused on the factors affecting milk consumption in the Soviet Union in the years 1985 and 1989. These two years were chosen because complete data sets existed for the former Soviet Union and they represented the time period before the Soviet demise. The factors affecting the levels of milk consumption are assessed.

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KEY WORDS AND DEFINITIONS

Milk Production:

Milk obtained by milkers from cows, water buffalo, yak cows, sheep, goats, camels and mares regardless whether it was sold or consumed on the farm.

Union Republic:

A nationality - based territorial - administrative unit, subordinated directly to the central organs of the Soviet Union, with structural attributes similar to that of an independent state. There were fifteen union republics within the Soviet Union, including the RSFSR.

RSFSR:

Russian Soviet Federated Socialist Republic

Autonomous Republics:

Autonomous Soviet Socialist Republics or ASSRs, subordinated to the RSFSR or a Union Republic, were established to give political recognition to important minority nationalities.

Kray:

A territorial - administrative unit, subordinated to the RSFSR, which usually had within its territory a subordinate administrative unit, such as Autonomous Oblast or Autonomous Okrug, giving recognition to national minorities in the territory.

Oblast:

A territorial - administrative unit, subordinated to the RSFSR or a Union Republic.

Economic Regions:

A grouping of contiguous administrative units used for the purposes of planning and statistical reporting. Economic regions were used to facilitate yearly comparisons among larger territorial areas.

CHAPTER I

1.0 INTRODUCTION:

The widely publicized goal of the Communist Party and the Soviet Government, which were guided by the basic principles of Marxist-Leninist ideology, was to ensure the well-being and full development of all members of society. Soviet authors have stressed the building of Socialism, where the "heroic" Soviet people under the leadership of the Communist Party, in the shortest historical period, accomplished the industrialization of a backward country (Bakumenko and Kachalov, 1958).

Since its inception however, the former Soviet Union set ambitious goals of industrialization allegedly for the improvement of the population's standard of living while concealing the real goal of the system: to enhance the power of the Communist elite. The Soviet authors, Braginskii and Duminov (1961), noted that the advantages of the planned Socialist economy made for a steady and rapid growth of labour productivity in all branches, including agriculture. The Soviet people were constantly reminded that they would attain the highest standard of living, higher than any capitalist country, in the near future. However, the Soviet Union has since ceased to exist and at no period did the well-being of the population

as a whole ever reach the levels of attainment in Capitalist countries. Instead, a new "Ruling Class" of Communist elite emerged, which attained a far greater standard of living and well-being than the rest of the Soviet population, negating the supposed social equality for all. Furthermore, attempts were made to conceal and distort unfavourable economic statistics such as those relating to the living standards of the population.

One of the most important indices that measures the satisfaction of the working people's requirements is per capita food consumption (Kirichenko, 1962). To achieve the goal of improving the level of nutrition in the Soviet Union, it was necessary for the leadership to consider the wide diversity of foods and quantities consumed in the different republics, autonomous republics, krays and oblasts of the land. Due consideration was given to the local peculiarities and sum total of factors influencing consumption. Yet, when surveyed by the former State Committee of the USSR for Statistics about their basic level of food consumption in 1990, the Soviet population indicated perceived shortages (Table 1). For example, the survey revealed that milk, an important source of protein, was not evenly distributed. The supply of milk was deemed adequate by only 56.3 percent of the respondents from the former Soviet Union as a whole,

TABLE 1.

Public Opinion About the Adequacy of Consumption of the Main Food Products, 1990

Share of those questioned who responded that they consume sufficient amounts of bread, milk, meat, fish, fruits/veg.

Republics	Bread	Milk	Meat/ Prod.	Fish	Fruits/ Veg.
USSR	97.7	56.3	18.9	21.6	28.3
RSFSR	97.7	56.9	20.3	21.8	20.3
Ukraine	97.8	52.6	14.6	18.0	37.1
Byelarus	99.0	88.4	29.0	14.9	26.6
Uzbekistan	99.2	43.5	10.7	28.0	47.5
Kazakhstan	97.5	59.4	23.7	26.4	34.3
Georgia	96.8	37.8	12.2	22.7	47.5
Azerbaijan	95.9	40.5	14.0	20.1	50.1
Moldova	97.6	64.6	18.0	8.2	49.4
Latvia	96.6	75.4	22.0	29.1	24.9
Kyrghyzstan	96.9	45.5	16.7	35.9	48.7
Tajikistan	94.7	54.0	8.0	22.9	51.1
Armenia	98.0	38.5	7.5	33.5	27.0
Turkmenistan	99.1	52.0	24.0	38.3	44.6
Estonia	98.0	82.0	40.3	29.0	18.7

(after sampling 30,000 people; carried out by the organization of state statistical bureau; 1990; in percentages)

Source: Sotsial'noye razvitiye SSSR, 1989, (1991), p. 145.

and although 88.4 percent perceived milk as being adequately supplied in Byelarus, only 37.8 percent and 38.5 percent perceived milk as being adequately supplied in Georgia and Armenia respectively. All of the other republics had values between these two points reflecting a broad range of perceived adequacy of milk supply.

These wide disparities would seem to indicate that milk consumption in the Soviet Union was not homogeneous, apparently negating the promises of communist ideology with regards to food consumption in general and milk in particular. The publication of some social and economic data for small administrative units since 1985 has enabled the author to identify factors affecting milk consumption. These factors will be used in an attempt to explain why the spatial patterns of milk consumption in the Soviet Union were so varied.

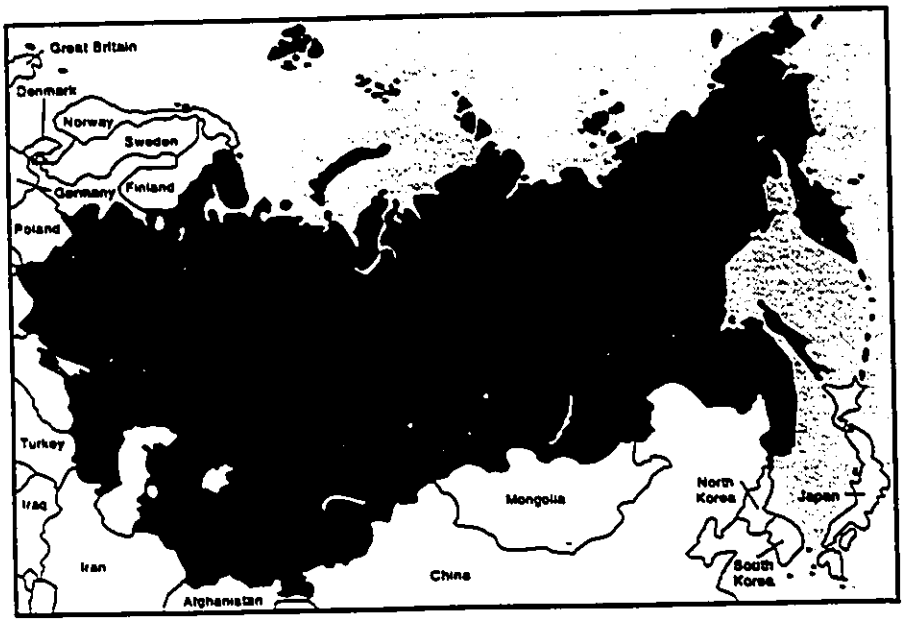
CHAPTER II

2.0 STUDY AREA:

The area under investigation is the former Soviet Union, also known as the Union of Soviet Socialist Republics (Map 1). Its territory covered approximately one-sixth of the earth's land surface and was more than 2.3 times the size of the United States of America. The former Soviet state was the third most populous country after China and India. It had existed as a political entity since December 30, 1922, but on December 25, 1991 this empire under the rule of the Communist Party ceased to exist. In its place are fifteen independent states, of which twelve make up the Commonwealth of Independent States. Despite its large natural endowment, the former Soviet Union was not particularly successful in agriculture (Gray, 1990; Brada and Wadekin, 1988; Kahan, 1961; Volin, 1958).

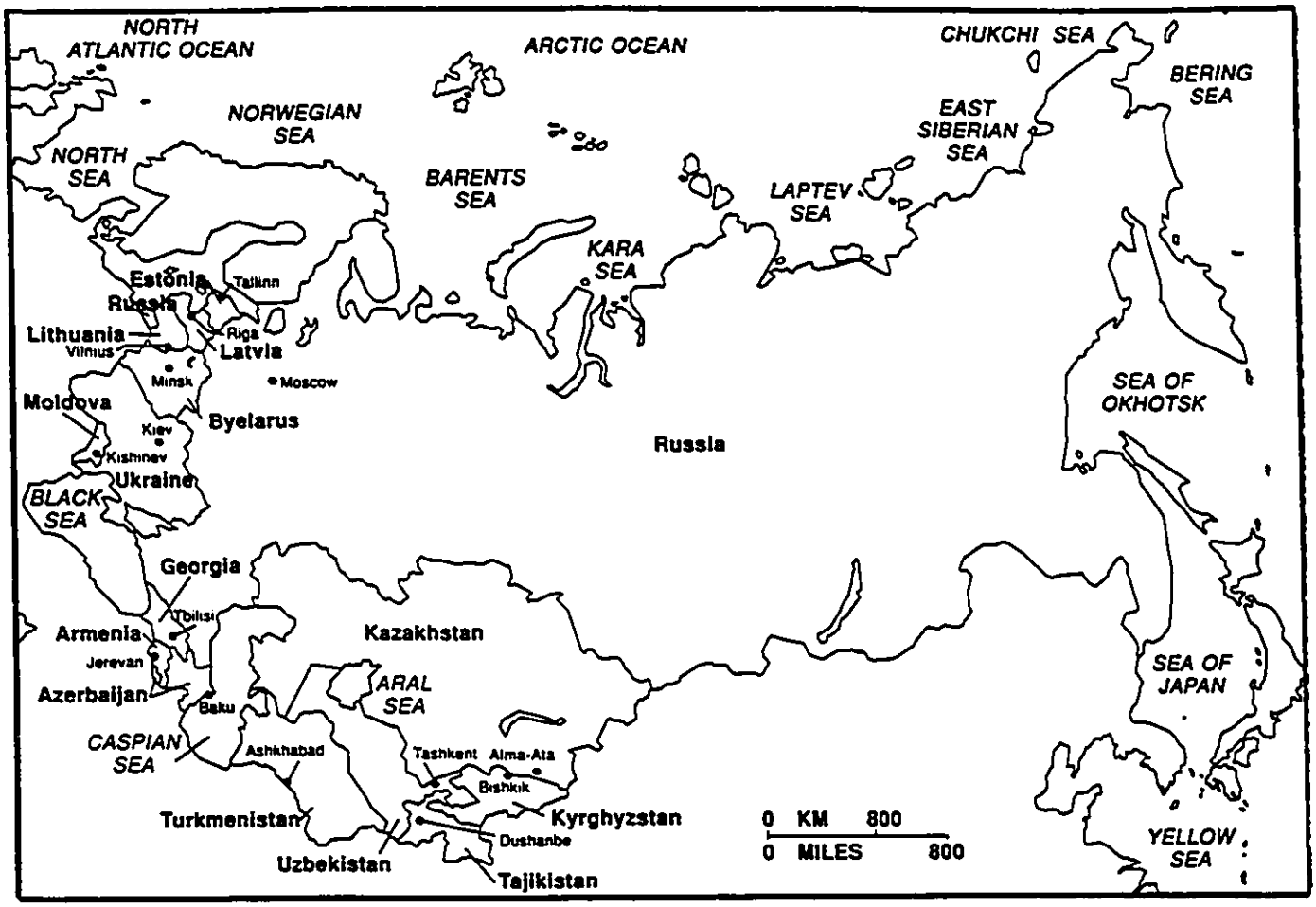
Before its disintegration, the former Soviet Union consisted of fifteen union republics (Map 2) and was dominated by the largest republic, the Russian Soviet Federated Socialist Republic or RSFSR. In comparative terms, the RSFSR held over half the total population of the former Soviet Union and over three quarters of the physical area (Table 2).

MAP 1. Location and Size of the Former Soviet Union



Source: "Commonwealth of Independent States," Annual Editions, 1992, p. 3.

MAP 2. Republics of the Former Soviet Union



Source: "Commonwealth of Independent States," Annual Editions, 1992, p. 2.

TABLE 2.

Area and Population Indicators for the Union Republics of the USSR, 1989

Republic	Area 1,000s of sq. km	Population 1,000s of people	Density per sq. km
Estonia	45	1,573	35
Latvia	64	2,680	42
Lithuania	65	3,690	57
Byelarus	207	10,200	49
Ukraine	604	51,707	86
Moldova	34	4,338	128
Georgia	70	5,443	78
Armenia	30	3,288	110
Azerbaijan	87	7,038	81
Turkmenistan	488	3,534	7
Uzbekistan	447	19,905	45
Tajikistan	143	5,109	36
Kyrghyzstan	199	4,290	22
Kazakhstan	2,719	16,536	6
RSFSR	17,075	147,400	9
USSR	22,277	284,203	13

Source: Lydolph, 1990, pp. 23-24.

Within the RSFSR, significant regional variations were also apparent. The territorial administrative units which comprised the former Soviet Union - Union Republics and autonomous republics, krays and oblasts within the RSFSR, were examined (Map 3 and Table 3). By examining these units together, it was easier to assess spatial variations. Moreover, for simplicity, economic regions, which comprise groupings of autonomous republics, krays and oblasts within the RSFSR, were used to summarize regional variations within the Russian Federation (Table 4).

In this study, data for the autonomous republics, krays and oblasts within the RSFSR will be analyzed together with that of the other Union Republics in their spatial context. The oblasts in the RSFSR are quite large. Their areas, population and population densities fall into the same range as those of the smaller Union Republics. The advantage of analyzing milk consumption figures for the republics and administrative units of the RSFSR together is both statistical and cartographic.

Distinctions in the level and structure of production in the various republics and economic regions depend mainly on the degree of regional economic development, agricultural specialization and the growth of the food processing industries (Kirichenko, 1962). Historically, the Baltic

MAP 3. Territorial Administrative Units of the USSR

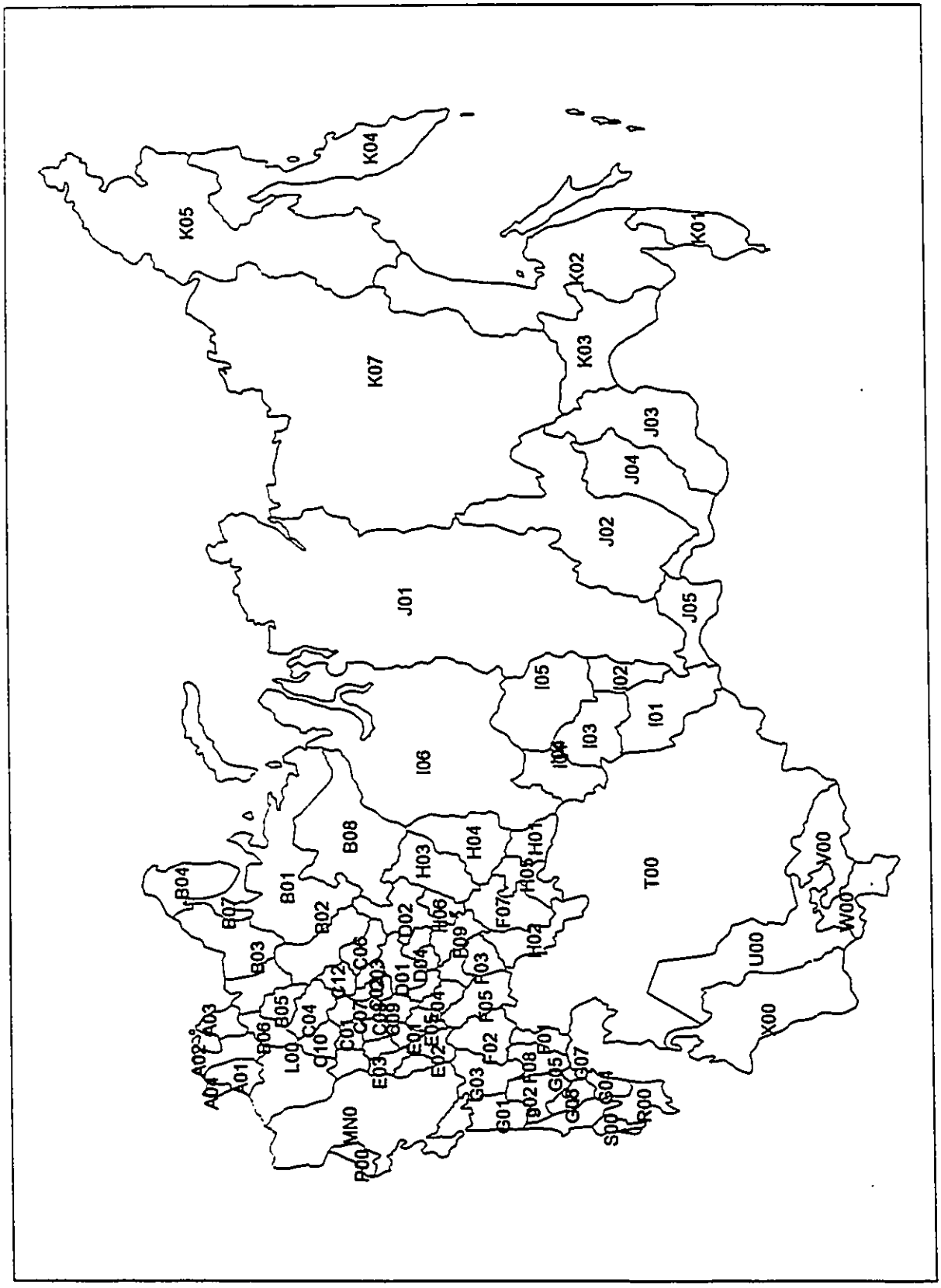


TABLE 3.

Codes Identifying Territorial Administrative Units of the USSR

A03	Estonia	F01	Astrakhan O.	K01	Primorsk Kray
A02	Latvia	F02	Volgograd O.	K02	Khabarovsk Kray
A01	Lithuania	F03	Kuybyshev O.	K03	Amur O.
A04	Kaliningrad O.	F04	Penza O.	K04	Kamchatka O.
B01	Archangel O.	F05	Saratov O.	K05	Magadan O.
B02	Vologda O.	F06	Ulyanovsk O.	K06	Sakhalin O.
B04	Murmansk O.	F07	Bashkir ASSR	K07	Yakut ASSR
B07	Karelian ASSR	F08	Kalmyk ASSR	L00	Byelarus
B08	Komi ASSR.	F09	Tatar ASSR	MN0	Ukraine
B03	Leningrad O.	G01	Krasnodar Kray	P00	Moldova
B05	Novgorod O.	G02	Stavropol Kray	Q00	Georgia
B06	Pskov O.	G03	Rostov O.	R00	Azerbaijan
C01	Bryansk O.	G04	Dagestan ASSR	S00	Armenia
C02	Vladimir O.	G05	Kabardino-Bal. ASSR	T00	Kazakhstan
C03	Ivanovo O.	G06	N. Osetian ASSR	U00	Uzbekistan
CO4	Kalinin O.	G07	Chechen-Ing. ASSR	V00	Kyrghyzstan
C05	Kaluga O.	H01	Kurgan O.	W00	Tajikistan
C06	Kostroma O.	H02	Orenburg O.	X00	Turkmenistan
C07	Moscow O.	H03	Perm O.		
C08	Orel O.	H04	Sverdlovsk O.		
C09	Ryazan O.	H05	Chelyabinsk O.		
C10	Smolensk O.	H06	Udmurt ASSR		
C11	Tula O.	I01	Altay Kray		
C12	Yaroslavl O.	I02	Kemerovo O.		
D01	Gorky O.	I03	Novosibirsk O.		
D02	Kirov O.	I04	Omsk O.		
D03	Mari ASSR	I05	Tomsk O.		
D04	Mordvin ASSR	I06	Tyumen O.		
D05	Chuvash ASSR	J01	Krasnoyarsk Kray		
E01	Belgorod O.	J02	Irkutsk O.		
E02	Voronezh O.	J03	Chita O.		
EO3	Kursk O.	J04	Buryat ASSR		
E04	Lipestk O.	JO5	Tuva ASSR		
E05	Tambov O.				

TABLE 4.

Area and Population Indicators for Economic Regions of the RSFSR, 1989

Economic Region	Area 1,000s of sq. km	Population 1,000s of people	Density per sq. km
Northern	1,451	6,093	4.2
Northwest	201	8,279	41.1
Central	486	30,379	62.6
Volga-Vyatka	263	8,457	32.1
Central Black	167	7,741	46.2
Volga	680	16,411	30.6
North Caucasus	356	16,737	47.1
Urals	681	20,287	24.6
West Siberia	2,428	15,003	6.2
East Siberia	4,124	9,155	2.2
Far East	6,216	7,941	1.3

Source: Lydolph, 1990, pp. 20-22.

republics, Belarus, Russia and Ukraine have had the highest per capita production and consumption of dairy products. By contrast, in Central Asia, because of its natural conditions, milk has lagged considerably behind the national average (Kirichenko, 1962).

Cultural dynamics provide an important consideration of the distribution of power and leadership. All the peoples of the Soviet Union -- whether Slavs, Turks or Mongols, Christians or Moslems - were systematically forced to renounce their national heritages, to accept Russian cultural patterns, and to rewrite their histories in conformance with the new Soviet brand of "Great Russian Chauvinism" (Roucek, 1954). Indeed, this Soviet policy of Russification took several forms: attempts to alter the vocabulary of the native language through the insertion of Russian words in their pure Russian form; the imposition of stiff Russian language prerequisites for attendance at institutions of higher learning or for career positions in the republics; and the fostering of Russian literature, art and history (Pipes, 1957). Figure 1 provides an example of the Soviet propaganda which portrayed the Russian people as "the leading force of the Soviet Union among all the peoples of our country" (Barghoorn, 1953).

As a result, while the Russians constitute approximately half the

FIGURE 1. Soviet Propaganda

FIRST AMONG EQUALS

"The Russian people . . . has earned . . . public recognition as the leading force of the Soviet Union among all the peoples of our country."

Source: Barghoorn, 1953, p.30.

population, individuals of Russian origin formed the absolute majority of the Soviet elite. Together with the two other major Slavic Soviet nationalities, Ukrainians and Belorussians, they accounted for eighty-five percent of the Central Committee elected by the Communist Party (Bialer, 1964). Although interrepublic differences in population welfare were sometimes publicly discussed, such studies were not emphasized because of potential sensitivity regarding "unequal" treatment of individual republics by the central government (Koropeckyj, 1988). According to Koropeckyj (1988), it appears there has been an attempt to avoid drawing undue attention to the relatively worse conditions in the republics at the lower end of the national welfare scale.

In this study, data for the republics of the former Soviet Union will be analyzed together with that of the autonomous republics, krays and oblasts within the RSFSR in their spatial context. In this regard, data was available for the subunits within the RSFSR whose areas, populations and population densities were in the same range as those of the smaller republics. Ultimately, it was believed that spatial variations in the levels of milk supply, wealth, urban proletariat, elite, children and cultural preferences were related to the variations in milk consumption.

CHAPTER III

3.0 LITERATURE REVIEW:

According to Krylov (1960), the Communist Party and the Soviet Government had always considered improvement in the well-being and culture of the Soviet people to be the most important task in developing the Socialist economy. Krylov (1960) claimed that under socialism the conditions for a steady, planned rise in public well-being had been created for the first time in the history of mankind. Judging by the promises of Communist ideology, the Russian people might have expected the improvement in their lot to be unprecedented and spectacular (Schroeder, 1971). In the early years of planning for rapid industrialization, claims were made that the level of living of the Soviet people would be three times that of the wealthiest capitalist country, the United States, in ten to fifteen years (Schroeder, 1971). Unfortunately, those years passed with little or no progress towards the grandiose goal.

Three decades later, Nikita Khrushchev tried to inspire the Soviet people by promising to catch up with the US in meat and milk production and achieve the highest standard of living in the world by 1980. However, despite Khrushchev's and subsequent Soviet leaders' efforts, and some

improvement in the consumption of animal products, the lofty goals were not attained. A clearer understanding of how the material lot of the Soviet people has changed under communism can be obtained by looking at the three major components of household consumption - food, non-food goods and services (Schroeder, 1970).

It is highly significant to note that at almost every crucial juncture of Russian history, agriculture has been the object of an avalanche of government decrees, official speeches, newspaper editorials and news reports revealing a situation of serious proportions in this important sector of the Soviet economy (Volin, 1955). The crux of the problem was inadequate production which adversely affected the standard of living of the population. Even more important was the low productivity of livestock, in particular low yields of milk per cow which were considerably behind planned goals (Volin, 1955).

Ever since Stalin collectivized agriculture, Soviet leaders have pursued an unending series of policy changes in search of a "Socialist" solution to the population's demand for improvement in the quality of diet (Laird, 1987). A measure of the seriousness with which the Soviet leadership had regarded the agricultural problem is the fact that prior to

being elevated to their exalted positions, Khrushchev, Brezhnev and Gorbachev each had established a reputation as a successful party leader in the agricultural realm. Despite this attention, no Soviet leader had fundamentally resolved the agricultural problem.

Based on Marxist-Leninist philosophy, Soviet scholars and authors openly expressed propagandistic views which relied on the "laws of socio-economic development," and were considered irrefutable proof of the superiority of the socialist system. Throughout its history, the Communist Party of the Soviet Union posed the "world-historic" task of providing the population of the former USSR with a living standard which would be higher than that of any capitalist country (Aganbegian, 1961). According to Braginskii and Duminov (1961), American farmers operated on a capitalist basis, under conditions of competition and ruthless exploitation of labour. In the USSR, by contrast, agriculture was run along Socialist lines, where all the collective farms were said to be "equal" participants in the system. The advantages of the planned Socialist economy allegedly made for a steady and rapid growth of labour productivity in all branches, including agriculture, leading to "substantial" increases in living standards, both in the city and in the countryside (Braginskii and Duminov, 1961).

Although the USSR was admittedly behind the US in agricultural labour productivity, the lag was less pronounced than "the enemies of socialism" would have us believe (Braginskii and Duminov, 1961).

Recent Soviet agrarian reform sought to improve the productivity and efficiency of the agricultural sector, to cut production costs and to work towards the elimination of subsidies (Wegren, 1992). According to Stebelsky (1990), President Gorbachev's proposed reforms included broadening initiative beyond reorganizing collective farms and state farms into agricultural firms, agricultural combines and their subdivisions, to include individual peasant family farms in the effort. The latter would be free to participate in collective, state and other larger enterprises through shares, joint stocks and leases. Gorbachev also recognized that such fundamental restructuring would necessitate the elimination of the existing bureaucracy for the management of agriculture and its replacement with a regulated market economy (Stebelsky, 1990).

However, the year 1989 witnessed a "collapse" of the consumer market, followed by ensuing consumer hysteria (Rumer, 1990). The economy was characterized by uncontrolled growth in prices, unimaginable currency issuance and bare store shelves (Rumer, 1990). In a majority of

Soviet cities items of daily necessity were rationed and economic conditions were getting progressively worse. Clearly, these attempted reforms failed.

The picture of the state of the Soviet economy prior to the Gorbachev years is incomplete and unreliable. As it fulfilled its "magnificent" plans for building communism, the Soviet Union declared it would outstrip the USA in a growing number of indices of living standards. While some Soviet authors sought to discredit Western views on the Soviet system, others sought to enhance the power of the USSR by means of propaganda. The result of this issue is that sources regarding the development of the Soviet economy must be approached with caution.

Statistics are one of the most important tools for measuring the achievements of Socialist construction, state management and planned guidance of the economy. However, the misuse and falsification of statistics to support Soviet propagandistic claims was clearly manifested. Yezhov (1958) boasted that for the first time in history, statistics were placed on the only really scientific basis of Marxism-Leninism, while Kuverin and Michailov (1958) charged that capitalist countries juggled facts, falsified Soviet statistical data, and artificially exaggerated defects

and difficulties - unavoidable in such a complicated matter as building socialism. They noted that all this betrayed the secret purpose: to hide the truth about the steadfast growth of the economic might of the world's first socialist country and the weakening position of imperialism (Kuverin and Michailov, 1958).

Indeed, since the early 1930's, the Soviet authorities had worked increasingly to perfect the process of concealment and distortion. They had limited the information that they released to those indicators which would inflate their achievements, and to provide substantiation for what Stalin called the "law" of the smooth, proportional development of the Soviet economy (Spulber, 1952). Thus, the first indicators to be suppressed were those relating to the living standards of the population directly or by implication. In the latter years of the decade, the curtain of secrecy began to fall on the indicators measuring performance in the highly strategic areas of economic activity (Herman, 1964). As a result, Prybyla (1962), identified three basic problems that had to be overcome: 1) difficulties of interpretation arising from differences in the economic and statistical concepts used in the Soviet Union and in the West; 2) deliberate Soviet suppression, omission or befogging of statistical data; and 3) faulty

reporting within the USSR at the enterprise or collective farm level.

According to Prybyla (1962), Soviet statistical yearbooks were poor in data and lopsided in the information they furnished. Duplication tended to exaggerate the volume of information supplied. For example, about one seventh of the Soviet Statistical Handbook for Industry (Promyshlemost SSSR), consisted of a mere repetition in percentage form of absolute figures presented elsewhere in the handbook (Prybyla, 1962). The last decade of Brezhnev's rule (1976-1985) saw the greatest diminution of politically sensitive statistics such as grain production or food consumption figures (Gray, 1990, p. v). During this decade the National Economy statistical yearbooks (Narodnoye khozyaystvo) had dwindled to about half the thickness of the early 1970s (Gray, 1990). Such curtailment of reporting implied economic difficulties and unsatisfactory performance. According to Koropeckyj (1988), no official explanation has ever been provided in the USSR for the failure to publish complete and comprehensive statistics on a regular basis. Not until General Secretary Mikhail Gorbachev's 1985 campaign for "glasnost" (openness) in all spheres of social life, including economic statistics, had comprehensive data been published for the USSR as a whole and the fifteen republics

comprising the former Soviet Union.

Under the Soviet system it is not enough to find explanations for the failure to meet plan targets - one must also find scapegoats (Kahan, 1961). This device of fixing the blame for failures on scapegoats is an old and familiar Soviet practise. For example, state administrators would blame deficiencies and shortcomings on subordinate farm managers or local officials. Similarly, when Khrushchev discussed historical flaws in Soviet agriculture, he carefully avoided any implication that they might have arisen from the nature of the Soviet system (Volin, 1958). Instead he lay chief blame on the farm managers, his subordinates, or his deceased predecessor, Stalin.

The main reasons for poor agricultural performance could easily be detected: adverse climatic conditions over substantial parts of Soviet territory and the inability to increase the feed supply rapidly enough to meet the needs of an increasing livestock herd (Kahan, 1961). Contributing factors include lack of fertilizer and shelters. These factors have had a long history and should have been neither new nor unexpected to the Soviet planners. Nevertheless, the inability to raise agricultural output coinciding with widely advertised promises to increase the standard

of living became a source of irritation for the Soviet leadership (Kahan, 1961).

Soviet authors, such as Andrienko (1958), Kirichenko (1961), Krylov (1960) and Kuznetsova (1961), agree that one of the most important indices of the Soviet people's growing level of welfare was the steady change in the level and structure of food consumption. Andrienko (1958), asserted that the goal of catching up to the USA in the near future in meat, milk and butter production will be a new great step on the road to Communism. According to Andrienko (1958), "The most important component of the progress of communist construction in our country is the steady growth of public consumption on the basis of abundance of food for the population." Alexeyev (1959) opined that, within a short time, the standard of living of the Soviet people will exceed in every respect the standard of living of the most advanced Capitalist countries.

The Institute of Nutrition of the USSR Academy of Medical Sciences has worked out scientifically-based physiological norms of nutrition which take into account the sum total of factors influencing consumption (Kirichenko, 1962). The physiological norms stipulate the best conditions for the all-round development of the organism and its vital activity

(Kuznetsova, 1961) and provide for definite regional differences in consumption (Kirichenko, 1962). The level and structure of consumption are also influenced by climate, the historically-shaped national traditions, the population's sex and age composition and its employment in different branches of the economy (Kirichenko, 1962).

Among the various food commodities, milk is an extremely valuable food. It is particularly valuable for children, and as a rule should be part of their daily diet (Kuznetsova, 1961). As with regard to other food commodities, there was optimism that the level of milk consumption will reach the scientifically based norms by 1965-68 (Kuznetsova, 1961).

Literature of the 1950s and 1960s demonstrates a deficiency in accurate Soviet milk production and consumption data. The lack of reliable data clouds the real situation with regards to milk production and consumption. However, according to Laird (1966), if all information is carefully sifted, such as statistical yearbooks (Narodnoye Khozyaystvo), it is possible to obtain a fairly close approximation to Soviet reality.

In a review of the USSR dairy industry, M.K. Barbashin (1974), Deputy Minister of the Meat and Dairy Industry of the USSR, wrote of substantial successes, improvements and outputs that the Soviet dairy

industry had recently achieved. Indeed, Barbashin (1974) contended that the targets of the national economic plan were completely realistic and should be regarded as minimal. Yet Barbashin (1974) admitted that for a number of types of output (whole milk, cheese) the production level attained had proven to be somewhat lower than was projected by the five-year plan for 1971-75. Thus, while the total output of milk showed significant attainment, the Soviet dairy industry of the early 1970s was in need of efficiency improvements.

Using the available data for this period, Kenneth Gray (1990) compared Soviet milk utilization to that of other countries, primarily the United States. While the former Soviet Union was the world's largest producer of milk, Gray found that only sixty percent of the protein in Soviet milk was consumed by humans. In comparison, Americans consumed over ninety percent of all protein in US produced milk. Although liquid milk consumption per capita in both countries was roughly the same, there was less fresh and more soured milk consumed in the Soviet Union. Production and consumption of cheese products and skim milk was also lagging in the former USSR (Gray, 1990).

Both Gray (1990) and Cornick, Cox and Gould (1994) noted two

difficulties with previous analyses of fluid milk consumption: 1. the aggregation of milk into a single commodity, and 2. the lack of investigation of the interrelationship of the demand for various milk types. Clearly, the 1986 data published in Narodnoe Khoziaistvo SSSR, reporting that milk (all milk products converted to milk equivalents) stood at per capita milk consumption levels greater than in the United States, should be regarded with caution because the conversion of whole milk to milk products is made solely in terms of butterfat (Gray, 1990).

Raw milk can be broken down into two major components in addition to water: fat (known as butterfat) and non-fat solids (protein, lactose and minerals) (Ewing, 1994). While Soviet citizens consume most of the butterfat (85 percent), they consume substantially less of the other major milk solids, the most important being protein (Gray, 1990). In Canada, however, where the milk production sector is administered under a system known as supply management, butterfat consumption has been in decline for several years due to demographic changes, taste changes, health factors and pricing policies. Consequently, the Canadian consumption of non-fat solids has increased or remained stable (Canadian Dairy Commission, 1993).

Utilizing raw milk more effectively, by decreasing the amount used as feed and investing more in milk processing, would reduce the need to produce so much milk and solve the Soviet Union's still unsatisfied demand for dairy products (Gray, 1990). However, more effective utilization of the non-fat solids requires a shift in the composition of milk products consumed. In particular, it would require Soviet consumer acceptance for products with less butterfat content (Gray, 1990). As household income and education rise, Cornick, Cox and Gould (1994) expect the demand for reduced fat milk to increase relative to that of whole fat milk. A reduction in the relative demand for butterfat is necessary if the growing demand for raw milk is to be dampened. This is particularly important because although a large fraction of the butterfat in raw milk is extracted, butter remains a deficit consumer good in the former Soviet Union (Gray, 1990).

Regional disparities in milk production and consumption in the former Soviet Union were not addressed at any length in the literature until the 1980s. I.V. Nikol'skiy (1981) revealed that spatial differences in consumption are determined by regional characteristics of demand. Indeed, population demand is determined by the living conditions in various parts

of the country. Nikol'skiy (1981) incorporated three levels of analysis ranging from a large region to an individual populated place, with regard to the economic geography of consumption and retailing. The motivating question behind Nikol'skiy's (1981) study was the revelation that more than eighty percent of personal consumption in the Soviet Union is satisfied through the network of retailing establishments. He determined what accounted for such a close relationship between food sales and consumption. At the regional level, he asserted "consumption and retailing are affected by the combination of the following factors characteristic of the entire region: physical and climatic conditions, the peculiarities and level of development of productive forces, the material well-being of the population, and ethnic characteristics, including existing traditions" (Nikol'skiy, 1981, p. 641).

M.A. Kaz'min (1989) provides a case-study approach in his examination of the complex problem of supply of whole milk products to the inhabitants of the Moscow agglomeration. Kaz'min (1989) postulates that multifaceted methods of economic geographic research are needed to improve the spatial organization of milk production. He attempts this by providing a comprehensive examination of all elements of spatial systems -

from the production of milk at agricultural enterprises and private plots, to its transportation, storage, processing and the sale of the final product at sites of ultimate consumption. Specifically, Kaz'min (1989) concludes that milk output in Moscow Oblast can be raised 1.5 times by utilizing existing fodder reserves more effectively. As well, Kaz'min (1989) recommends that exports of milk and milk products from highly urban areas of the oblast adjoining Moscow and from the Meshchera lowland be significantly reduced in order to ensure the more complete satisfaction of local demand.

Ihor Stebelsky's (1988 and 1994) studies indicate that milk production and consumption in the former Soviet Union show pronounced regional disparities. Specifically, the Baltic republics, Belarus, Ukraine and Moldova were found to be net suppliers of milk while the remaining republics, including the Russian Federation, were net recipients. This may be due to the fact that the northwest region of the former Soviet Union is more conducive to the growing of hay crops and pasture and of raising dairy cattle than it is to cash grains or industrial crops. In addition, Stebelsky found that the production of milk in the former Soviet Union could neither satisfy its domestic demand, nor was the mean consumption

level in each republic, even after imports, up to the standards of the Soviet "scientifically-established norms" (1994, p. 2).

The literature discussed on milk production and consumption in the former Soviet Union initially lacked credibility due to the unavailability and unreliability of data. This made it difficult to grasp the true situation of milk production and consumption in the former Soviet Union. Nevertheless, a general picture was formed which showed many shortcomings and weaknesses in the former Soviet milk demand and supply process. These included the irrational use of milk as feed, inadequate investment in milk processing and an underdeveloped transportation system (Brada and Wadekin, 1988).

Regional studies indicating milk production and consumption levels of each republic and oblast of the former Soviet Union in comparison to one another were noticeably absent from the literature prior to 1981. This dearth of analytical work reflects the rather sensitive nature of the topic of regional disparities and stems from the fact that information on food consumption for the union republics was scarce, incomplete, and had appeared in published form only recently and sporadically (Brada and Wadekin, 1988, p. 99). The problem was finally addressed by Nikol'skiy's

(1981) "Linkages Between the Geography of Consumption and the Geography of Food Retailing," Kaz'min's (1981) "Spatial Organization of Milk Production in the Moscow Region" and more specifically by Stebelsky's (1988 and 1994) analyses of "Milk Production and Consumption in the former Soviet Union."

The availability of new statistical data on per capita consumption of milk for each union republic (Soyuznyye Respubliki, 1991) and oblast-level territories within the Russian Federation (Narodnoye khozyaystvo RSFSR v 1988 g., 1989), allowed Stebelsky (1994) to spatially illustrate milk production and consumption patterns as well as milk balances at the regional level for the Soviet Union. These spatial patterns indicated that milk consumption and production in the former Soviet Union were not homogeneous and that inter-regional transfers of milk and milk products had to provide for consumption in excess of local supply. A conceptual flow model encompassing factors affecting milk consumption in the former Soviet Union needs to be identified in order to explain why spatial variations do indeed exist.

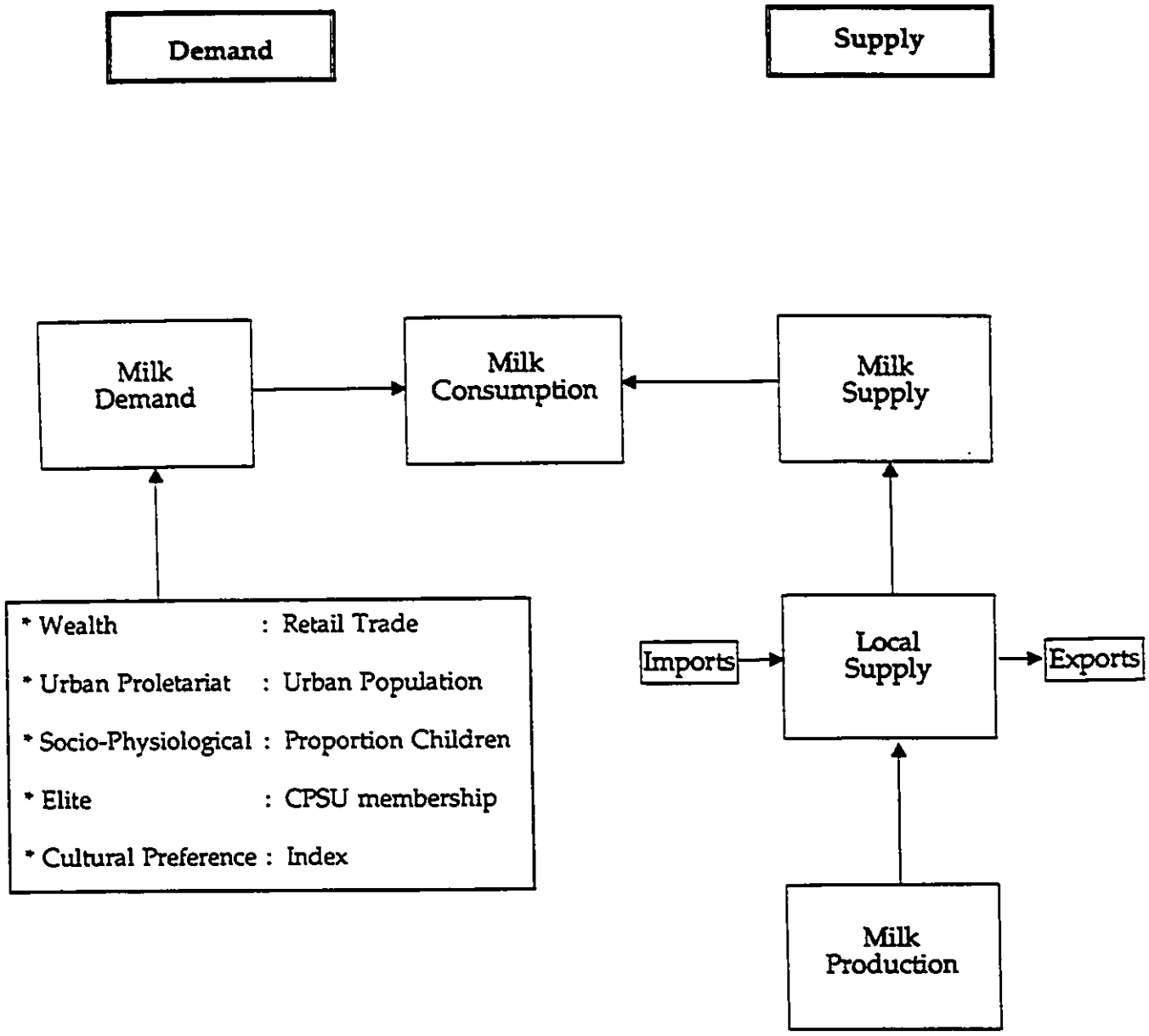
CHAPTER IV

4.0 A PRIORI MODEL:

An a priori model (Figure 2) has been constructed to illustrate the flow of milk from production to consumption. This a priori model illustrates which factors are thought to affect milk consumption in the former Soviet Union. The demand for milk per person is reflected in milk consumption per capita which, in turn, is fulfilled by milk supply per capita. Milk supply is determined by local milk production plus milk imports, less milk exports. If a region cannot produce enough milk to satisfy local demand, and if the interregional system of exchanges cannot supply additional milk from elsewhere, then local supply becomes a limiting factor. Specifically, strong positive relationships between milk consumption per capita in kilograms and per capita milk production in kilograms indicates high dependency on the local availability of milk.

In the Soviet Union milk was allocated to consumers by a combination of 1) market and 2) administrative means. In reference to the a priori model used in this study, the market demand function specifically involves per capita retail trade in rubles as a surrogate for food consumption demand or the general level of spending by the population of

FIGURE 2. A Priori Model



Source: Author, 1995.

a given region. In contrast, administrative demand reflects priorities in the central allocation system, which may include: the percentage of urban population as an indicator of the importance of the urban proletariat in the region; Central Committee of the Communist Party of the Soviet Union memberships per million population to gauge administrative allocation of milk to the elite; number of children per thousand population as a surrogate for socio-physiological requirements; and a cultural preference weighted-index of milk to gauge the administrative allocation of milk to regions where milk is culturally preferred.

Specifically, retail trade per person in rubles will be used as an indicator of food consumption demand. During Gorbachev's term of office, items of daily necessity were rationed and economic conditions were beginning to deteriorate. The Soviet economy was characterized by uncontrolled growth in prices, a rate of currency issuance that "staggers the imagination" and bare store shelves (Rumer, 1990).

Percentage of urban population will be used to gauge administrative allocation of milk to the urban proletariat. Giese and Hecht (1983) observed a core-periphery gradient for meat consumption, typical for market economies. Moreover, the number of Central Committee of the

Communist Party of the Soviet Union memberships per million population will be used to gauge allocation to the elite. Apparently the "ruling class" attained a far greater standard of living than the rest of the Soviet population, negating the supposed social equality for all.

To account for the socio-physiological importance of milk allocation, the number of children per thousand population will be used in this study. Cornick, Cox and Gould (1994), state that the presence of children significantly affects milk expenditures, with a decline in the percentage of young children having a negative impact on fluid milk demand (Weersink and Tauer, 1990).

According to Nikol'skiy (1981), spatial differences in consumption are determined by regional characteristics of demand. Perhaps a meaningful way of illustrating the degree to which each region culturally prefers and consumes milk is to derive a cultural preference-weighted index.

4.1 HYPOTHESES:

Several hypotheses may be formulated from the a priori model. First, it is believed that milk consumption is limited to its local supply. Indeed, regions where the milk supply is higher, will consume more milk per capita than in regions where the milk supply is lower. As Volin (1955), stated, inadequate production adversely affects the standard of living of the population. The availability of milk is considered to be a major factor for milk consumption. Regions would be more inclined to consume larger amounts of milk because of its local availability. In addition, consuming more milk on a regular basis would become a dietary habit and a cultural trait.

It is also hypothesized that the "ruling class" were favoured over all other people in the central allocation process. That is, territorial administrative units with higher Central Committee of the Communist Party of the Soviet Union (CPSU) memberships per million population will possess higher levels of milk consumption than in those republics with lower Central Committee of the CPSU memberships. Similarly, it is believed that the urban proletariat were viewed as an important sector of the economy which would be reflected through higher levels of milk

consumption in regions with higher levels of urban population (Stebelsky, 1994).

Also, in regards to affluence, it is hypothesized that the wealthier people consumed more milk. This hypothesis is indicative of the income demand variation and would reflect milk consumption levels along with per capita retail trade in rubles. Regions which have a higher volume of retail trade per capita likely had a higher ability to pay, making them favourable in the milk allocation process.

Cultural preference also serves as an indicator of milk consumption levels (Nikol'skiy, 1981 and Kirichenko, 1961). It is hypothesized that regions with higher cultural preference for milk as expressed by the milk preference-weighted index, consumed more milk.

Also, it is hypothesized that milk consumption is significantly dependent on socio-physiological factors. As mentioned earlier, milk is a valuable source of protein for children and should be part of their daily diet (Kuznetsova, 1961). The number of children per thousand population acts as a surrogate for these factors, and it is hypothesized that regions with greater amounts of children per thousand population consume more milk per capita than do regions with fewer children per thousand population.

Finally, it is hypothesized that the Central Committee of the Communist Party of the Soviet Union memberships per million population and percent urban population will be most strongly related to milk consumption for the year 1985, indicative of the former Soviet Union's central allocation process.

For decades, the Soviet agricultural system featured obligatory deliveries and an irrational pricing system that often required farms to sell goods for less than their real costs (Wegren, 1992). Moreover, it is also hypothesized that retail trade per person in rubles will be most strongly related to milk consumption for the year 1989, indicative of President Gorbachev's reforms and the proposed market economy. These reforms explicitly favoured the market over central planning (Aslund, 1991), and created a new set of political and legal institutions that put an emphasis on land tenure outside the collective or state farms for the first time (Wegren, 1992). Before the hypotheses were accepted or rejected, a framework for testing was formulated. The methodology which follows, details the steps in the data collection and describes the series of tests that the data set underwent before analysis.

CHAPTER V

5.0 METHODOLOGY:

Research for this study was conducted in two stages. The first stage assessed the spatial patterns of milk consumption in the former Soviet Union. The second stage analyzed factors that explain the spatial variation of milk consumption. Factors affecting milk consumption were derived from the review of literature and the results were compared to those of Stebelsky's (1994) study.

Before the advent of "glasnost" (openness), as is widely known, the Soviet authorities were notoriously selective in publishing information about many highly significant aspects of Soviet society. By the late 1980s, however, new statistical data were published on more politically sensitive topics. These included the per capita consumption of milk and milk products (converted to milk equivalents) for each union republic from 1985 to 1990 (Soyuznyye respubliki, 1991) and, within the Russian Federation, for its oblast-level territories for 1985 and 1989 (Narodnoye khozyaystvo RSFSR v 1989 g., 1990).

Stebelsky's (1994) study focused on the year 1988 because of the availability of a uniform data set on the production of butter, cheese and

canned milk by union republics for 1985, 1986, 1987 and 1988 (Agropromyshlennyy kompleks SSSR, 1990). This study focused on the years 1985 and 1989 as these are the most widely separated years for which complete comprehensive data sets exist for the consumption and production of milk and milk products converted to milk equivalents.

Spatial patterns of per capita milk consumption levels for 1985 and 1989 for each Union Republic and autonomous republics, krays and oblast-level territories within the RSFSR were examined. This data was gathered and mapped for each region. The process of mapping milk consumption per capita for each of the 85 regions for both 1985 and 1989, and assessing the results, concluded the first, or descriptive stage of data analysis.

Next, a stepwise multiple regression was performed for each of the years, 1985 and 1989 to determine which factors were most closely spatially related to the levels of milk consumption. Milk consumption per capita in kilograms (of milk and milk products converted to milk equivalents) was chosen as the dependent variable.

Stebelsky (1994), in studying milk consumption patterns in the Republics of the Soviet Union in 1988, found that milk production, retail trade, urban population and workers and employees affected the patterns

of consumption. In this study, milk production, retail trade and urban population will be reconsidered. Retail trade may be used as a surrogate for food consumption demand or the general level of spending by the population when expressed, in rubles per capita. Percent urban population acts as an indicator of the movement of milk to the urban proletariat and milk production on farms per capita in kilograms acts as an indicator of the local availability of milk.

Three additional variables will be included in this study to explain milk consumption patterns. Central Committee of the Communist Party memberships per million population will be used to measure the importance of the "ruling class" in the region, as a factor in milk allocation. The number of children per thousand population will be used as an indicator of socio-physiological requirements. Finally, a cultural preference-weighted index will be used to represent the historical importance of milk for each region. A step-by-step outline detailing the process in which the author collected data for this study is described in the subsequent sections.

5.1 Published Statistical Data

Published data were gathered in several stages. First, a series of USSR statistical yearbooks were used to collect statistical data for each Union Republic for the years 1985 and 1989. Next, Russian Federation yearbooks were used to collect statistical data for each of the seventy-one autonomous republics, krays and oblasts within the RSFSR for both years. Some of the data sets were not consistent from year to year and were subsequently converted into proper units in order to maintain uniform variables for the years 1985 and 1989. Lastly, the republican and oblast-level territory data for each variable, which were published in Russian, had to be translated into English.

Soyuznyye respubliki (1991), was used to obtain the milk consumption per capita (in kilograms of milk and milk products converted to milk equivalents), as well as the figures for milk production on farms per capita in kilograms for each union republic for the years 1985 and 1989. Similarly, Narodnoye khozyaystvo RSFSR v 1989 g. (1990), was used to obtain the milk consumption per capita (in kilograms of milk and milk products converted to milk equivalents) for each autonomous oblast of the RSFSR for the years 1985 and 1989. However, Narodnoye

khozyaystvo RSFSR v 1989 g. (1990) only contained aggregate milk production on farms figures expressed in 100 000s of kilograms for the years 1985 to 1989. Consequently, these 1985 and 1989 aggregate figures of milk production on farms for each administrative unit had to be divided by the mid-year population figures which were derived by adding January 1, 1985 figures (Narodnoye khozyaystvo RSFSR v 1984 g., 1985), with January 1, 1986 figures (Narodnoye khozyaystvo RSFSR v 1985 g., 1986), and dividing by two. Similarly for 1989, January 1, 1989 (Narodnoye khozyaystvo RSFSR v 1988 g., 1989), population figures were added to January 1, 1990 (Narodnoye khozyaystvo RSFSR v 1989 g., 1990), population figures and then divided by two. After the mid-year population figures were calculated, they were divided by aggregate milk production which resulted in milk production on farms per capita in kilograms. The same process was applied to the USSR data for Union Republics. Republican population figures for January 1, 1985 and January 1 1986 were extracted from Naselenie SSSR 1987 statisticheskii sbornik. (1988), while January 1, 1989 and January 1, 1990 republican population figures were taken from Sotsial'noye razvitiye SSSR, 1989. Statisticheskii sbornik. (1991).

Republican retail trade per capita in rubles figures for the years 1985 and 1989 were obtained from Sotsial'noye razvitiye SSSR 1989, a statistical compendium published in Moscow in 1991. Once again, Narodnoye khozyaystvo RSFSR v 1989 g. (1990), was used to collect RFSFR oblast figures for retail trade per capita in rubles for both 1985 and 1989.

To obtain the percent urban population data for all the regions of the Soviet Union for the years 1985 and 1989, four separate documents were consulted. First, Naselenie SSSR 1987 (1988), was used to obtain the actual urban population figures for each republic. These figures were then divided into the total population figures for each republic which resulted in the percent urban population for each republic for 1985. Similarly, Sotsial'noye razvitiye SSSR 1989 (1991), was used to obtain the 1989 percent urban population figures for each republic of the Soviet Union. Moreover, Narodnoye khozyaystvo RSFSR v 1984 g. (1985), and Narodnoye khozyaystvo RSFSR v 1988 g. (1989), were used to obtain percent urban population figures for each autonomous republic, kray and oblast of the RSFSR for the years 1985 and 1989 respectively.

Finally, statistical yearbooks were used to obtain figures on the

number of children per 1000 population for each republic and autonomous oblast of the RSFSR. According to the Soviet government documents Soyuznyye respubliki (1991), and Narodnoye khozyaystvo RSFSR v 1989 g. (1990), children are defined as, "those that are younger than working age." For this variable, figures were collected for the year 1989 only. The rationale behind this decision was two-fold. First, it was thought that the change in this variable from 1985 to 1989 in most regions would not have been significant and second, figures on the number of children per 1000 population for the year 1985 were not available.

5.2 Central Committee of the CPSU Membership Data

To gauge the importance of the 'Ruling Class' in each region, Central Committee of the CPSU memberships per million population for each Union Republic and autonomous oblast in the RSFSR were calculated. First, the most recent and comprehensive membership list, The Composition of Leading Organs of the CPSU (Kraus, 1976), was consulted. It contained: CPSU CC Politburo and Secretariat membership lists, CPSU CC Full and Candidate membership lists, and CPSU Central Auditing Commission of the Soviet Union members. The Politburo and Secretariat, full and Candidate, and Central Auditing members for each region were recorded next to the union republic or autonomous republic, kray or oblast in the RSFSR that they represented. This list (Kraus, 1976), of Central Committee of the CPSU members and their corresponding regions within the Soviet Union were then totalled and subsequently divided by the 1985 population figures of each union republic (Naselenie SSSR 1987 1988), and autonomous republics, krays and oblasts within the RSFSR (Narodnoye khozyaystvo RSFSR v 1984 g., 1985), to arrive at the values for the Central Committee of the CPSU memberships per million population.

5.3 Cultural Preference-Weighted Index

The cultural preference-weighted index for milk (Appendix B), required a series of separate stages to formulate. Initially, ethnic cook books were collected for many of the fifteen republics. Other regional cookery texts were collected in an attempt to represent all of the major ethnic regions of the Soviet Union. Next, twenty main-dish recipes for each republic or ethnic region were consulted and scanned specifically for either a presence of milk or an absence of milk. Milk "presence" was defined by the author as a significant amount of milk or dairy products utilized in the recipe itself. This is best illustrated by a comparison of Ukrainian varenyky (dumplings) and Soviet Central Asian chebureki (also dumplings). Varenyky contain 1/2 cup of milk, one pound of cheese, and two cups of sour cream. This constitutes a significant milk presence, whereas, three tablespoons of butter required for chebureki does not constitute a significant milk presence.

After the twenty main-dish recipes for each republic or ethnic region were collected and scanned for milk, a total out of twenty, representing the presence of milk was scored. Then a percentage was calculated by dividing the tabulated score by twenty and multiplying it by 100. This

percentage represented the cultural preference of milk for each republic or ethnic region in the Soviet Union. At this point it was decided that the cultural preference-weighted index would best be suited to a 1.00 scale. For example, a tabulated milk presence in all twenty recipes would result in a perfect 1.00 on the cultural preference-weighted index and a tabulated milk presence in eight of the twenty recipes would score a 0.40 on the index. Therefore, the calculated percentages of the cultural preference of milk for each republic or ethnic region were multiplied by 100.

Next, to obtain accurate cultural preference-weighted index values for each autonomous republic, kray and oblast within the vast and diverse RSFSR, other documents were consulted. The many ethnic groups which comprise the autonomous oblasts within the RSFSR were assigned values corresponding to one of the fifteen titular nationalities of the Union Republics on the basis of their linguistic affinity. Bruk and Kabuzan (1989) in their paper, "The Dynamics and Ethnic Composition of the Population of Russia in the Era of Imperialism," provide a comprehensive languages and dialects table entitled the "Distribution of Population of the Russian Empire by Native Language." This table was used to assign smaller ethnic groups to the corresponding value on the basis of their

linguistic affinity. Examples include the Buryats, Kalmyks and Yakuts corresponding to the republic Uzbekestan on the basis of their linguistic affinity.

Once this procedure was completed, the ethnic composition of each autonomous republic, kray and oblast, and their corresponding milk significance values, were multiplied together and then totalled to calculate a cultural preference-weighted index for each administrative unit. Ethnic composition was computed from nationality data in the 1989 national population census (Natsional'nyy sostav naseleniya SSSR po dannymn vsesoyuznoy perepisi naseleniya 1989 g., 1991).

Once the data for the dependent variable and each of the independent variables for 1985 and 1989 were collected, they were subjected to a series of statistical procedures and tests in order to accept or reject the previously mentioned hypotheses (section 4.1). A brief description of these procedures is given below.

5.4 STATISTICAL METHOD:

Analysis of factors relating to the spatial variation of milk consumption levels was conducted in several steps. First, the 1985 and 1989 values of the 85 observations for milk consumption per capita in kilograms (the dependent variable) and milk production per capita in kilograms, retail trade per capita in rubles, percent urban population, Central committee of the CPSU memberships per million population, children per thousand population and cultural preference-weighted index values (the independent variables) were tested for normal distribution. Next, correlations were calculated to measure the strength of the relationships (as measured by the coefficients of determination) between the dependent variable and each of the independent variables for both years. Finally, the a priori model was operationalized as a stepwise multiple regression, and was performed for each of the years, 1985 and 1989.

The chosen statistical package to analyze the dependent and independent variables was "SPSS for Windows, Release 6.0." Within this package a number of procedures were used to perform a series of tasks: plot the data in histograms and scatterplots; calculate means and standard

deviations; check for normality; calculate linear correlations and perform a multiple regression.

Stepwise multiple regression analysis was used to measure the extent to which selected factors explain the variation of milk consumption in the Soviet Union. The analyses also identified the relative importance of each of the independent variables. Two analyses were performed: the first to evaluate the effects of the independent variables for the year 1985 and the second, to evaluate the effects of the independent variables for the year 1989. These two analyses were performed to determine whether factors affecting milk consumption differed over the time period of President Gorbachev's incipient reforms.

One independent variable may explain a considerable amount of variance but still leave some variation unexplained. The addition of several other variables to the equation helps find the best-fitting plane in n-dimensional space which most accurately describes the relationship between the variables. The simultaneous effects of several independent variables on the dependent variable can be assessed through the construction of a step-wise multiple regression equation:

$$y = a + b_1 X_1 + b_2 X_2 + \ldots b_n X_n$$

where Y = the dependent variable; X_1, X_2, X_n = independent variables; a = intercept of the linear surface; b_n = regression coefficient for the nth variable, "X_n."

Each of the two step-wise multiple regression analyses were run to assess the strength and validity of the relationships between the independent variables and the dependent variable. The first regression used data from 1985, the second used data from 1989. The analyses helped to assess factors which affect milk consumption in the Soviet Union. Before these regressions were carried out, spatial patterns of milk consumption in the former Soviet Union for each of the years, 1985 and 1989 were mapped for assessment purposes. The resulting maps are illustrated in the following section along with a corresponding assessment of milk production, consumption and balances in the former USSR republics and autonomous republics, krays and oblasts of the RSFSR.

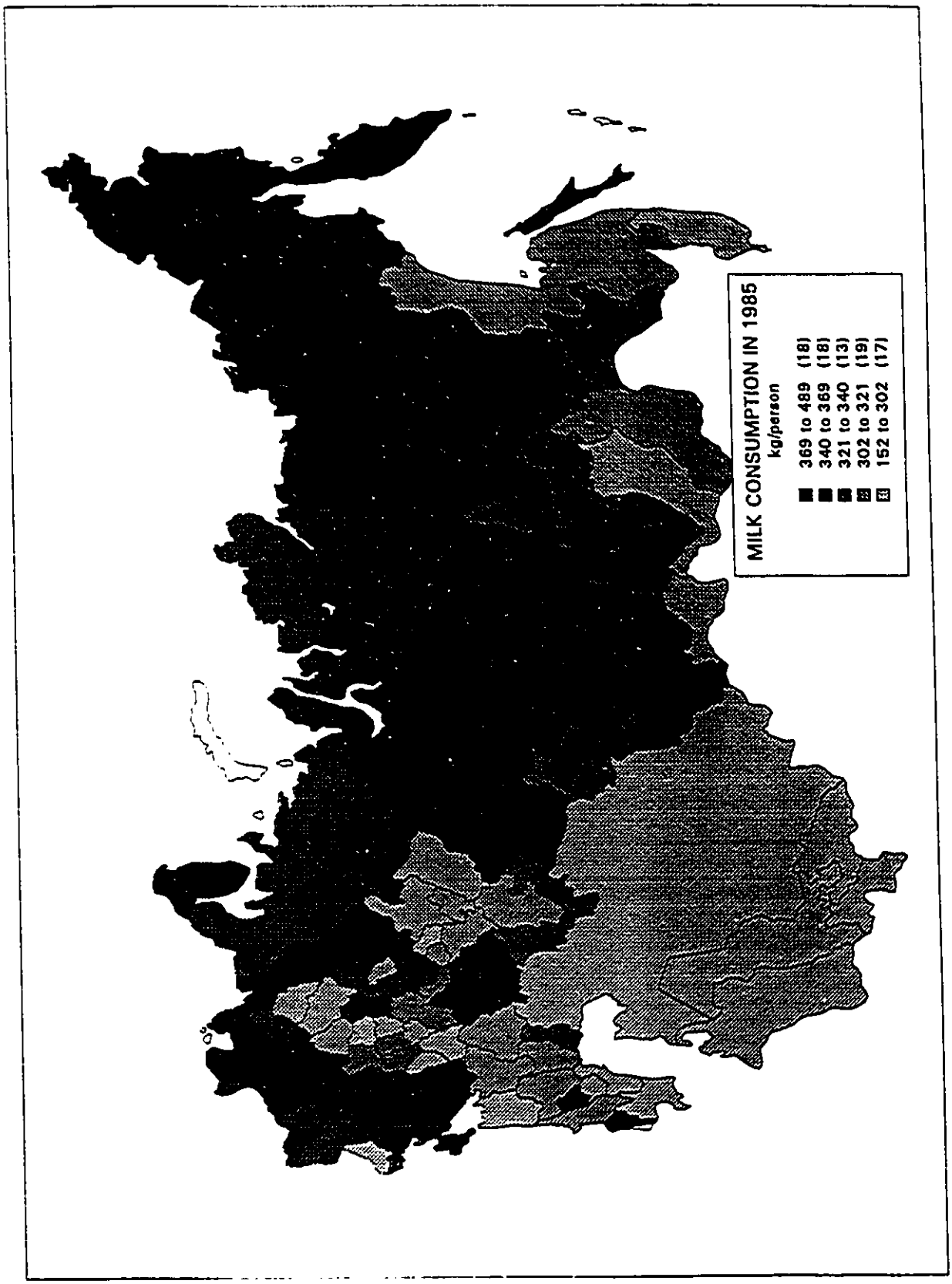
CHAPTER VI

SPATIAL PATTERNS OF MILK CONSUMPTION AND PRODUCTION:

Official data suggest that overall consumption of fluid milk and similar products in the former Soviet Union was comparable to that of the United States and many European countries, but not as high as that of Canada or the U.K., and far behind Ireland, Finland and Sweden (OECD, 1991). Within the Soviet Union, however, there were very significant inter-republican variations in milk consumption.

Aggregate levels of the 1985 milk consumption (of milk and milk products in fluid milk equivalents) are shown in Map 4. The pattern is rather fragmented, with the highest levels occurring in the Baltics (Estonia, Latvia and Lithuania), Belarus, Armenia, in the oblasts of the primate cities and some strategically important areas in the north, encompassing the Western Siberia and Far East economic regions. The lowest levels of milk consumption, by contrast are mostly concentrated in Central Asia, Kazakhstan, Azerbaijan and within Russia, Buryat ASSR, Tuva ASSR and in Dagestan ASSR, Chechen-Ingushetia ASSR and Krasnodar Kray. Specifically, Estonia, Latvia and Lithuania consumed 489, 455 and 409

MAP 4. Milk Consumption Per Capita in Kilograms, 1985

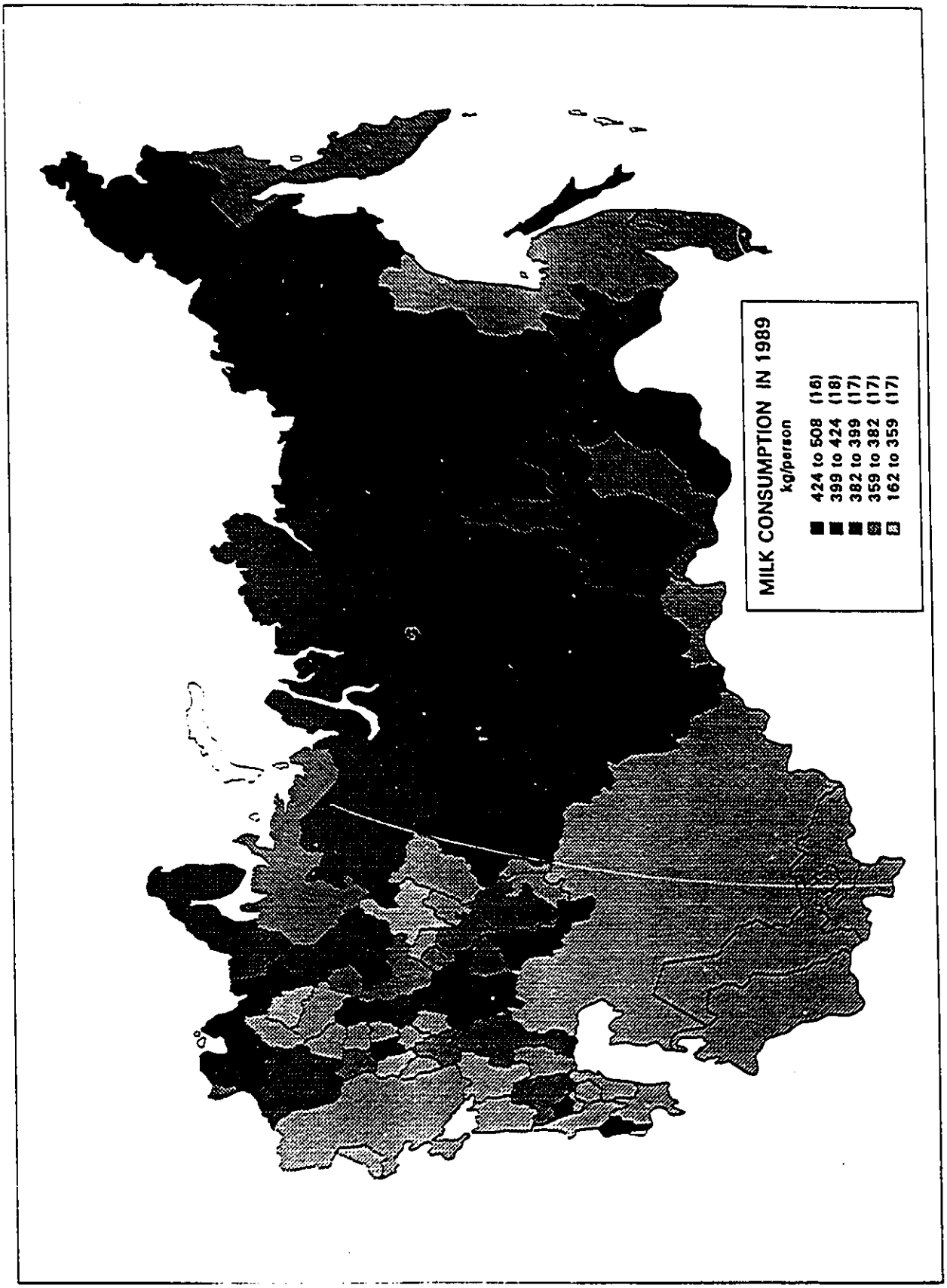


kilograms of milk per person per year, respectively. The Central Asian Republics, by contrast, such as Tajikistan (152 kg per capita) and Turkmenistan (168 kg per capita) consumed far less milk. Similarly, Dagestan ASSR and Tuva ASSR consumed 242 and 253 kilograms per person per year respectively.

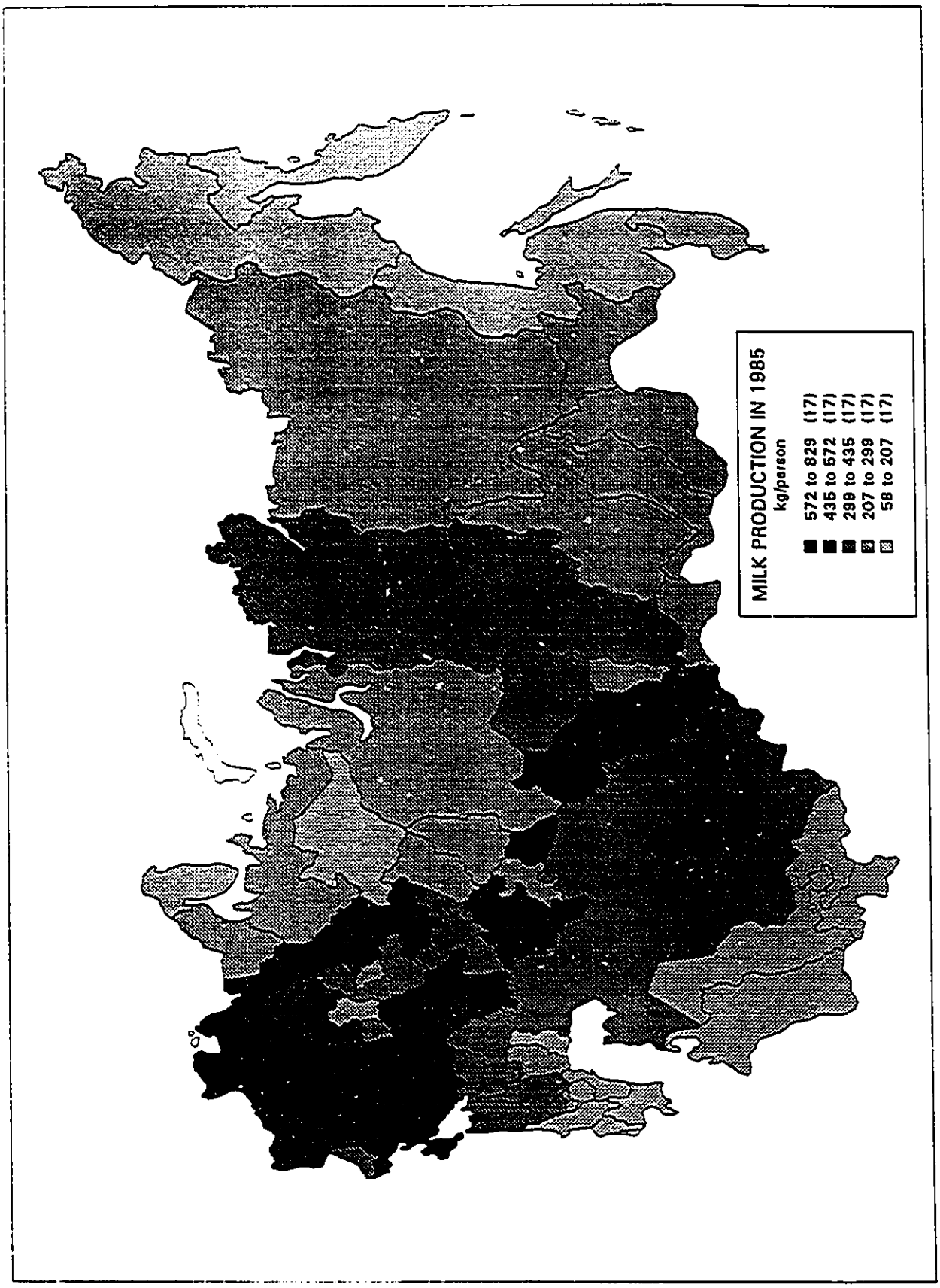
The situation in 1989 changed slightly (Map 5). The Baltic Republics each increased their per capita milk consumption totals. Estonia consumed 508 kilograms of milk per person in 1989, an increase of 4 percent from 1985. Latvia consumed 457 kilograms of milk per person in 1989 and Lithuania consumed 454, showing an increase in per capita consumption of 11 percent from 1985. Armenia also showed a marked increase as per capita consumption rose 11 percent to 480 kilograms. Once again, the lowest levels of milk consumption in 1989 were mostly concentrated in Central Asia, Kazakhstan, Azerbaijan and within Russia, in Dagestan ASSR, Tuva ASSR, Chechen-Ingush ASSR and Krasnodar Kray.

For comparison, the pattern of 1985 milk production per person is shown in Map 6. The range between the highest and the lowest levels of per capita milk production is double that of consumption levels. The

MAP 5. Milk Consumption Per Capita in Kilograms, 1989



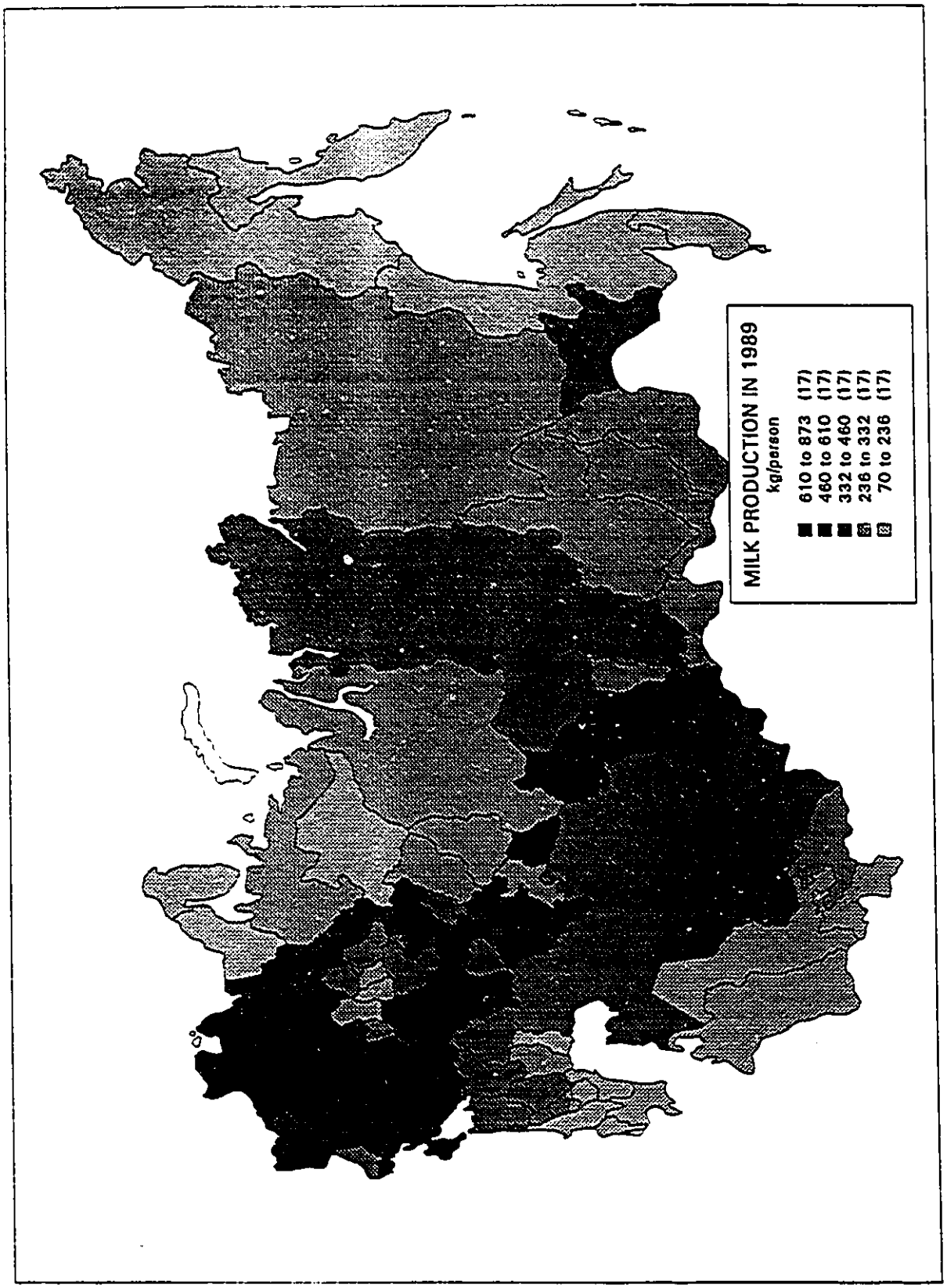
MAP 6. Milk Production Per Capita in Kilograms, 1985



pattern, too, is different. Although the highest levels of production coincide with consumption in the Baltics and Belarus, in Russia, the highest levels of production follow the central belt of rural regions extending from Smolensk O. through Belgorod O., Tambov O., Kurgan O. and Omsk O. to Atlay Kray. Specifically, milk production per capita levels for the Baltics in 1985 were: Lituania, 829 kilograms; Estonia, 820 kilograms and Latvia, 749 kilograms. The next highest milk producing republic was Byelarus with 678 kilograms per person. The Central economic region was by far the most productive milk producing region within the RSFSR in 1985 with no less than three oblasts (Orel, Ryazen and Smolensk) with production levels over 670 kilograms per person. Lower levels of milk production per person are found in the major urban-industrial regions, in much of the Northwest and Far East economic regions and the lowest in the republics of Central Asia. Specifically, the lowest totals of per capita production of milk in 1985 belong to Turkmenistan with an output of 108 kilograms and Khabarovsk, in the Far East, with an equally marginal output of 107 kilograms.

The 1989 milk production patterns (Map 7) are almost identical to those for 1985 with few exceptions. Most noticeably, Kyrghyzstan

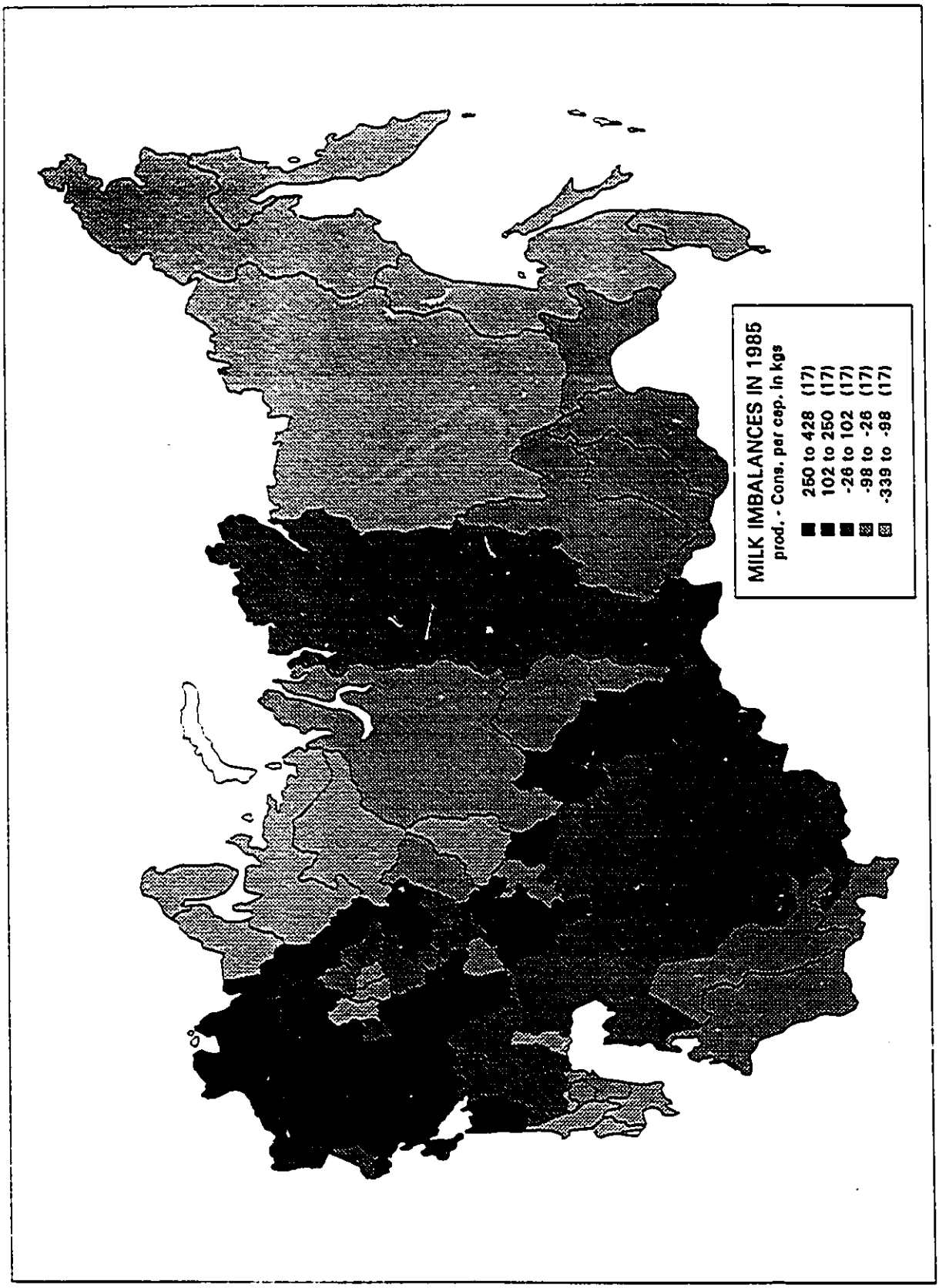
MAP 7. Milk Production Per Capita in Kilograms, 1989



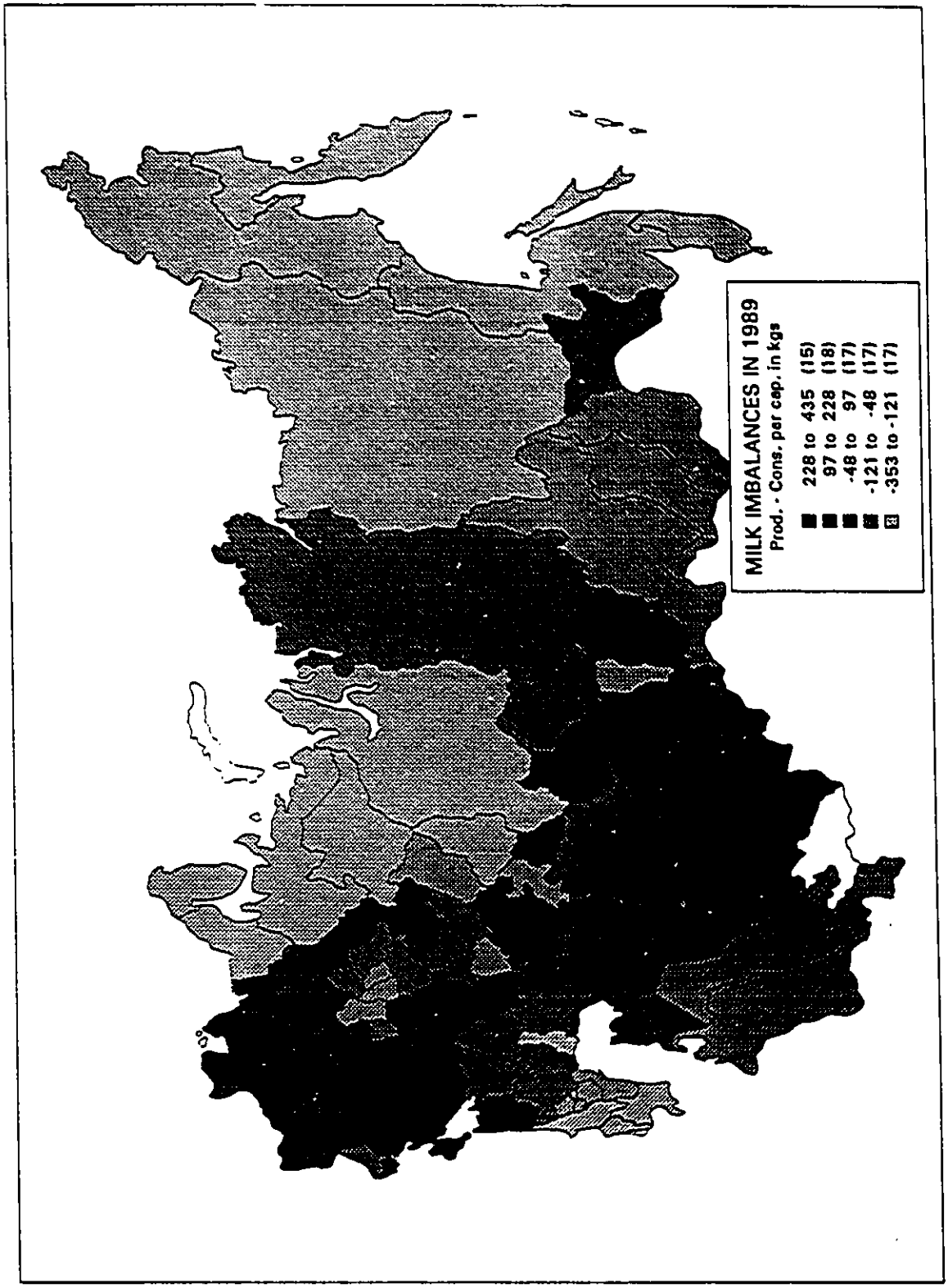
Increased its per person milk production by 45 percent to 278 kilograms over the four year period. Moreover, the Leningrad and Voronezh oblasts both significantly increased their already high milk production capabilities, while Amur, a moderate milk producing oblast in the Far East economic region increased its per person milk production by 30 percent to 373 kilograms over the same four year period. Once again, the lowest levels of milk production per person for the year 1989, were found in the more remote and agriculturally marginal areas of the North and the Far East economic regions and the lowest in Tajikistan and other republics of Central Asia.

The differences between per person production and consumption are revealed as regional milk imbalances for the years 1985 and 1989 (Maps 8 and 9 respectively). Major net suppliers stand out with high positive values and are shown in the darkest shade. Major net recipients have high negative values and are shown in the lightest shade. Other regions are either smaller suppliers or recipients. The Baltic republics were by far the greatest net suppliers. Lithuania led the way with a 420 kilograms per person milk surplus in 1985. Falling closely behind in 1985 were Estonia with 331 kilograms per person and Latvia with 294 kilograms per person

MAP 8. Milk Imbalances, 1985



MAP 9. Milk Imbalances, 1989



net surplus of milk. The Slavic republics, (Byelarus, Ukraine and Moldova) in 1985, followed the same pattern as the Baltics, acting as net suppliers of milk. Specifically, Byelarus, with a 279 kilograms per person surplus of milk, was similar to Latvia while Ukraine (102 kilograms per capita) and Moldova (46 kilograms per capita) had surpluses of milk to a lesser extent.

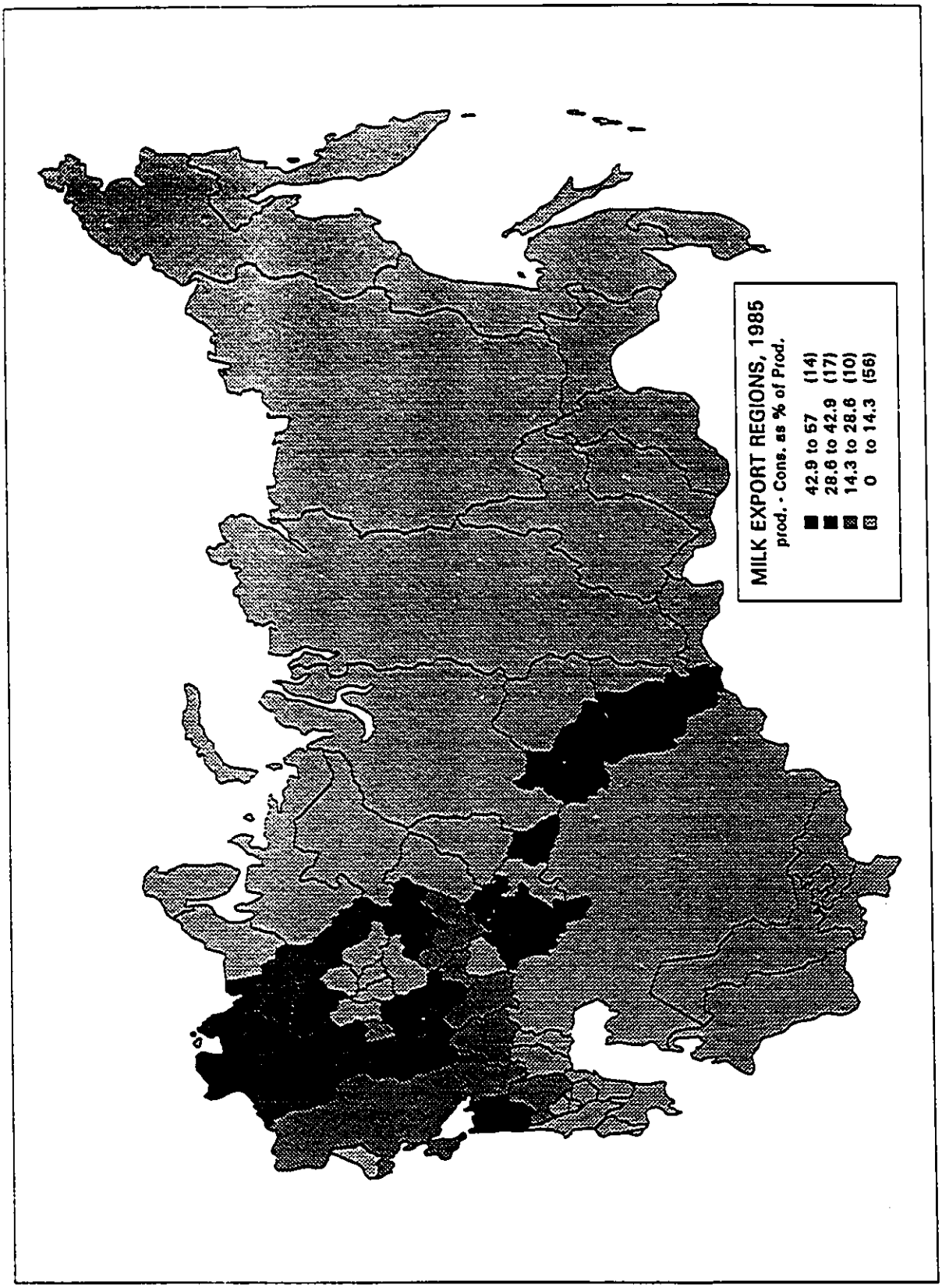
The Caucasian republics (Georgia, Armenia, Azerbaijan) were all milk-importing regions in 1985. That year, Armenia consumed 270 kilograms of milk per person more than they produced. Similarly, Georgia and Azerbaijan necessitated milk imports (178 and 150 kilograms of milk per person respectively), to satisfy consumption levels.

Kazakhstan and the Central Asian republics (Uzbekistan, Kyrghyzstan, Tajikistan, Turkmenistan) could be divided into two groups: milk exporters and milk importers. In the former group, Kazakhstan (39 kilograms per person milk surplus) and Kyrghyztan (10 kilograms per person milk surplus) produced more milk than they consumed. In contrast, Tajikistan, Turkmenistan and Uzbekistan were all net importers of milk with the latter importing 46 more kilograms per person to satisfy consumption in 1985.

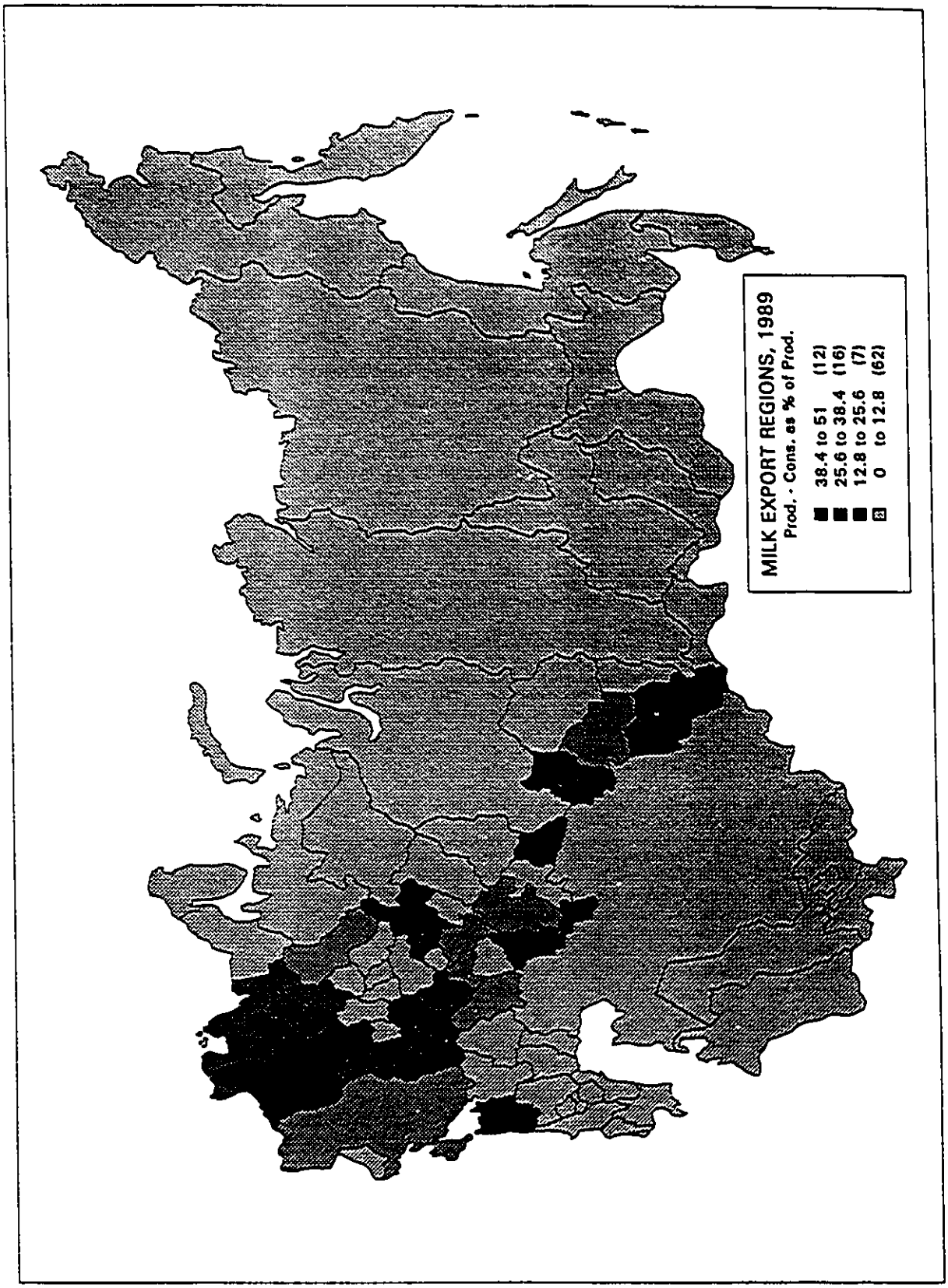
The oblasts within the RSFSR also varied in milk production and milk consumption. The data pertaining to the individual oblasts will be summarized using economic regions. The Far East, Eastern Siberia, Western Siberia, Northwest and Northern regions were all heavy milk deficit regions. In order to satisfy milk consumption, these regions relied on milk imports from surplus regions. In contrast, the Central, Central Black Earth, Volga-Vyatka and Volga regions were generally all milk surplus regions and could satisfy their own consumption levels through local production. The 1989 milk-balance patterns in the RSFSR were similar to those of 1985.

Perhaps a more meaningful way of illustrating the importance of a region as a supplier of milk may be measured by the 1985 net export as percent of its production (Map 10). Similarly, net export as percent of its production for 1989 data is illustrated in Map 11. While eight supplier regions attained levels of exports that exceed 50 percent of their milk production in 1985 (Lithuania, Pskov O., Orel O., Ryazan O., Smolensk O., Belgorod O., Kursk O. and Omsk O.), only three supplier regions attained these same levels in 1989. They were Kursk O. (51), Orel O. (50) and Ryazan O. (50).

MAP 10. Milk Export Regions, 1985



MAP 11. Milk Export Regions, 1989



The availability of milk is considered to be a major factor for rural milk consumption. For urban consumption, however, milk allocation through state purchases, processing and inter-regional shipments of processed milk products represents a significant spatial redistribution. This allocation may occur as a result of market forces, where purchasing power plays a key role, or through administrative decision-making based on political preferences. The subsequent section provides an analysis of the factors believed to affect milk consumption in the former Soviet Union.

CHAPTER VII

ANALYSIS OF FACTORS RELATING TO MILK CONSUMPTION:

Multiple regression analysis was used to measure the extent to which selected factors explained the variation in milk consumption in the Soviet Union. The analyses also identified the relative importance of each of the independent variables. Two analyses were performed: the first to evaluate the effects of the independent variables on milk consumption for the year 1985 and the second to evaluate the effects of the independent variables on milk consumption for the year 1989.

Prior to selecting the factors for use in the step-wise multiple regression analyses, the degree of normality of the independent variables was checked in a series of steps. First, the values of the 85 observations for milk consumption per capita in kilograms (the dependent variable) and retail trade per capita in rubles, percent urban population, Central Committee of the Communist Party memberships per million population, children per thousand population, milk production per capita in rubles and cultural preference-weighted index values (the independent variables) were tested for normality. Next, correlations were calculated to measure the strength of the relationships (as measured by the coefficients of

determination) between the dependent variable and each of the independent variables. Then, two stepwise multiple regressions were performed, in which each variable added provided incremental explanation.

The "SPSS for Windows, Release 6.0" program was used to generate a series of histograms and scatter plots for each of the six independent variables for each of the years, 1985 and 1989. Histograms provided a convenient way to display the distribution of such grouped values. A normal curve was superimposed over each of the histograms. The curved line indicated what the distribution of cases would be if the variable had a normal distribution with the same mean and variance. From the histograms, 1985 milk production per capita in kilograms, 1985 retail trade per capita in rubles, 1985 percent urban population, children per thousand population and cultural preference-weighted index values (the independent variables) were found to be normally distributed. 1989 milk production per capita in kilograms, 1989 retail trade per capita in rubles and 1989 percent urban population (independent variables) were found to be normal as well. However, the Central Committee of the CPSU memberships per million population (independent variable) had a very strong positively skewed distribution. A logarithmic transformation was carried out to improve its

normality (Norusis, 1993, p.336). Additional histograms and scatterplots using the transformed data were graphed, but showed no significant improvement.

Moreover, the Lilliefors test, based on a modification of the Kolmogorov-Smirnov test was used to verify the data for the assumption of normality. This test is used when means and variances are not known but must be estimated from the data. It was hypothesized in the null that the observed distribution was not significantly different from a normal distribution. The K-S (Lilliefors) $D_{max\ probability}$ values for each of the independent variables were as follows: 1985 milk production per capita in kilograms (0.503), 1985 retail trade per capita in rubles (0.006), percent urban population (0.926), children per 1000 population (0.021), cultural preference-weighted index of milk (0.000) Central Committee of the CPSU memberships per million population (0.000), 1989 milk production per capita in kilograms (0.596), 1989 retail trade per capita in rubles (0.001) and percent urban population (0.575). All of the independent variables except 1985 and 1989 retail trade per capita in rubles, Central Committee of the CPSU memberships per million population and cultural preference-weighted index of milk were found to be normally distributed at 0.01 level

of significance. The reasoning behind rejecting the null hypothesis in terms of Central Committee of the CPSU memberships was as follows. The observed significance level for Central Committee of the CPSU memberships (0.00) was small enough to reject the null hypothesis that the data were normally distributed. Consequently, the data for the Central Committee of the CPSU memberships per million population was not used in any further statistical analysis. Although the data for retail trade and cultural preference variables were not normally distributed, they were not modified, because they were not significantly skewed (see Appendix E). Both retail trade data and the cultural preference-weighted index values were leptokurtic, and the data were not significantly skewed. Therefore no transformations were needed. However, both retail trade variables and the cultural preference-weighted index variable were still used due to the large sample size and that the regression analysis was robust to the departures of normality.

Next, correlations were calculated to measure the strength of the relationships between the dependent variable and each of the normally distributed independent variables. A correlation matrix was constructed for each of the years, 1985 and 1989 (See tables 5 and 6).

TABLE 5. Correlation Matrix For 1985

	Milk Con.	Milk Prod.	Retail Trade	Urban Pop.	Child ren	Cult-Pref.
Milk Con.	1.000					
Milk Prod.	0.309 *	1.000				
Retail Trade	0.688 **	0.041	1.000			
Urban Pop.	0.604 **	-0.108	0.588 **	1.000		
Child-ren	-0.566 **	-0.590 **	-0.362 **	-0.522 **	1.000	
Cult-Pref.	0.570 **	0.468 **	0.436 **	0.378 **	-0.594 **	1.000

N cases: 85 one-tailed significance: *0.05 **0.01

TABLE 6. Correlation Matrix for 1989

	Milk Con.	Milk Prod.	Retail Trade	Urban Pop.	Child ren	Cult-Pref.
Milk Con.	1.000					
Milk Prod.	0.381 **	1.000				
Retail Trade	0.584 **	0.050	1.000			
Urban Pop.	0.601 **	-0.067	0.552 **	1.000		
Child-ren	-0.590 **	-0.582 **	-0.363 **	-0.578 **	1.000	
Cult-Pref.	0.558 **	0.442 **	0.445 **	0.412 **	-0.594 **	1.000

N cases: 85 one-tailed significance: *0.05 **0.01

The strongest relationship of milk consumption for 1985 in descending order, was with retail trade (0.688), urban population (0.604), cultural preference (0.570), children (-0.566) and, finally, with production (0.309). Only moderate collinearity was observed among the independent variables. In 1989, the strongest relationship of milk consumption in descending order, was with urban population (0.601), children (-0.590), retail trade (0.584), culture (0.558) and, finally, with milk production (0.381). Again, only moderate collinearity was observed among the independent variables.

Then, a stepwise multiple regression was performed for each of the years, 1985 and 1989, in which each of the variables added provided incremental explanation (Tables 7 and 8). For the 1985 data, three variables were significant. Together they explained 61.0 percent of the variation in consumption. Solving for the 1985 multiple regression equation, $Y = a + b_1x_1 + b_2x_2 + b_3x_3$ the constant and b values were as follows: Y = 231.31 + 0.10 (retail trade) - 0.30 (children) + 1.01 (culture).

For the 1989 data, three variables were also found to be significant. Solving for the 1989 multiple regression equation, $Y = a + b_1x_1 + b_2x_2 + b_3x_3$ the constant and b values were as follows: Y = 1.25.19 + 2.12 (urban

TABLE 7.

Stepwise Multiple Regression Explaining the Variation in Milk Consumption in the Soviet Union, 1985

Added Variable	Incremental Multiple R	DF	F	Sig. F
Retail Trade	0.688	1	74.60	0.000
Children	0.767	2	58.63	0.000
Cultural Preference	0.781	3	42.11	0.000

Simultane. All Var.	Beta	B	T	Sig. T
Retail Trade	0.508	0.103	6.519	0.000
Children	-0.270	-0.290	-3.096	0.027
Cultural Preference	0.188	1.012	2.078	0.041
Constant		231.308	4.869	0.000

Y = 231.31 + 0.10 (retail trade) - 0.30 (children) + 1.01 (culture)

TABLE 8.

Stepwise Multiple Regression Explaining the Variation in Milk Consumption in the Soviet Union, 1989

Added Variable	Incremental Multiple R	DF	F	Sig. F
Urban Population	0.601	1	46.96	0.000
Milk Production	0.734	2	47.99	0.000
Retail Trade	0.779	3	41.73	0.000

Simultane. All Var.	Beta	B	T	Sig. T
Urban Population	0.454	2.123	5.406	0.000
Milk Production	0.395	0.108	5.634	0.000
Retail Trade	0.314	0.050	3.742	0.003
Constant		125.192	5.155	0.000

Y = 125.19 + 2.12 (urban pop.) + 0.11 (milk prod.) + 0.05 (retail trade)

population) + 0.11 (milk production) + 0.05 (retail trade). Urban population, milk production and retail trade were found to be significant, indicating that 60.7 percent of the total variation in milk consumption could be explained by these three variables.

The multiple regression results suggest several findings. From the 1985 regression, retail trade per capita appears to be the best predictor of milk consumption, at least among the variables included in this study. Children per thousand population (negatively) and cultural preference also appear to be important. Regions with high numbers of children per thousand population were found to consume less milk, probably due to the fact that these areas were less urbanized than others. (the r between children and urban populations is -0.588 *) The Transcaucasian Republics, Central Asian Republics and Kazakhstan all had high numbers of children per thousand population while consuming the lowest amounts of milk per capita. This could be a result of lower urbanization levels, and cultural factors on these areas. Meanwhile, the Central, Central Black Earth, Volga and Volga-Vyatka economic regions of the RSFSR, all had low numbers of children per 1000 population, but higher levels of milk consumption per capita. In the regression analysis, urban population levels and milk

production levels were not significant in predicting the consumption pattern of 1985, which may be due to the fact that they were moderately collinear with the other independent variables in the model.

For 1989, by contrast, urban population was the best predictor of milk consumption. Milk consumption was also related to milk production and retail trade. Regions in which there were higher percentages of urban population consumed more milk. It appeared that the government allocated more milk to highly urbanized Union Republics and autonomous republics, krays and oblasts of the RSFSR because the urban population was favoured in the allocation process. Thus, milk consumption was related to the inter-regional distribution system. The administrative subunits which produced large amounts of milk also usually, but not always, consumed large amounts of milk. Lastly, in 1989 republics and RSFSR subunits with higher volumes of retail trade had a higher ability to pay for milk, somewhat strengthening their position in the milk allocation process. In 1989 though, the importance of retail trade had decreased from being the most significant variable according to the t-test to the least significant. This suggested that the milk allocation process was principally activated through administrative mechanisms and not through economic mechanisms.

It appeared that government authorities were catering to the urban areas, which corresponded to the concentration of political power and wealth.

Although cultural preference was found to be significant in the 1985 multiple regression its effect was less striking in 1989. According to the correlation matrix for 1989 (Table 5), the relationship between milk consumption and cultural preference may be reflected through each of the significant variables (urban population, milk production and retail trade), as they were all shown to be moderately correlated to cultural preference, each with correlation coefficient values around 0.40. Moreover, levels of children per thousand population seemingly did not affect the levels of milk consumption in the former Soviet Union for the year 1989, and may be explained through the increases in milk consumption per capita in the traditionally low milk consuming regions and through the overall average increase in milk consumption per capita of 50 kilograms per person over the four year period.

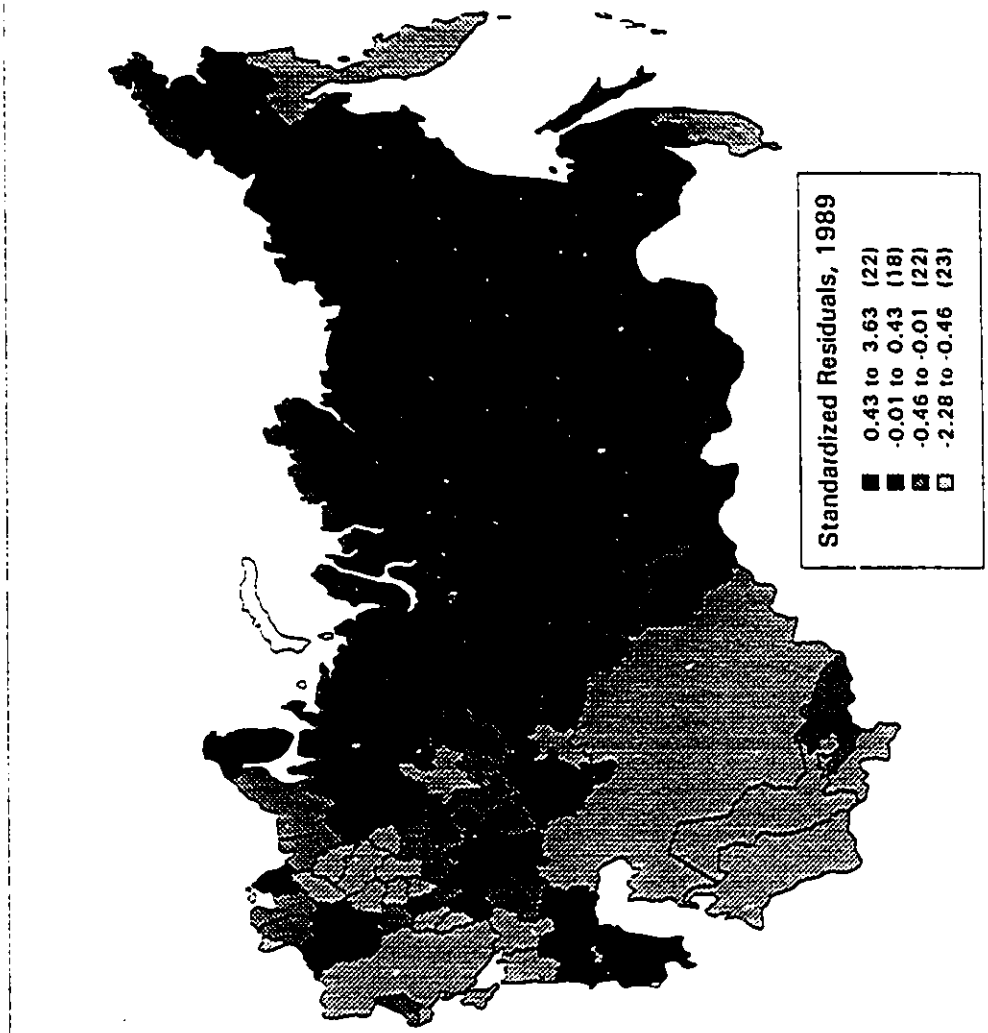
These results suggest that the allocation process, in 1985, favoured those with the ability to pay. "Backdoor" sales may have played an important role as those with higher cash income, consumed more milk (Goldman, 1960 and Severin, 1995). This importance is indicated by a

standardized partial regression coefficient of 0.51. By 1989, the results suggest that the allocation of milk to the cities represented a powerful tool to favour the proletariat of the urban centres (standardized partial regression coefficient of 0.45), while market played a weaker, subsidiary role.

A spatial autocorrelation analysis was performed in order to test the independent variables used in the correlation and regression for the presence of autocorrelation effects. Rook's case contiguity matrix was chosen as the method of testing for spatial autocorrelation (Clark and Hosking, 1986 and LaValle, 1990). Moreover, rook's case contiguity matrix was used to evaluate the hypothesis that significant autocorrelation is present in the spatial distribution. The null hypothesis is that zero spatial autocorrelation is present in the spatial distribution. Next, the rook's case autocorrelation coefficient was calculated. In order for this to occur, the standardized residuals for both the 1985 and 1989 step-wise multiple regressions were mapped (Maps 12 and 13). Since the data was depicted on choropleth maps composed of discrete areas, they required an assessment of contiguity relationships prior to the autocorrelation analysis. The contiguity between arreal units was defined by the rook's case

MAP 12. Standardized Residuals, 1985

MAP 13. Standardized Residuals, 1989



definition. In the rook's case definition, contiguity is said to exist if two areas have just a border in common (LaValle, 1990).

A contiguity matrix depicting the contiguity relationships present on the map was constructed for each of the years. This was done by using the coded values for each area and arranging the sequence of codes in order according to contiguity. Then if an area i is contiguous to another area j the standardized residuals for each are placed in the ith row and jth column of the matrix. Where contiguity does not exist, 0's were placed in the matrix. Once rook's case contiguity matrix values were established, both the autocorrelation coefficient for 1985 and 1989 were computed. The 1985 r value of -0.0043 indicates no significant autocorrelation. However, the 1989 r value of 0.1780 indicates very weak but significant positive autocorrelation, at the 0.01 significance level. The positive value of r indicates clustering in the 1989 spatial distribution induced by a weak non random process. Although a very weak pattern of positive autocorrelation existed in the 1989 data, it only accounted for 3.24 percent of the variance in the system which probably will not seriously bias the estimates of the partial regression coefficients in the model. Perhaps the cluster of underpredicted milk demands in the higher elevated regions around the

Caspian Sea will account for the bulk of the autocorrelation. This constitutes a need for further study.

Of the standardized residuals, nine cases fall beyond 1.5 z residuals above or below the trend predicted by the five variables. These include Uzbekistan (neg.), Turkmenistan (neg), Kyrghyzstan (neg.), Armenia and the North Osetian ASSR. The fact that Uzbekistan, Turkmenistan and Kyrghyzstan residuals were contiguous and less than -1.40 may account for some of the positive autocorrelation in the system. This may have been a result of the possibility that the cultural preference variable may not have been as effective as possible. In future studies the refinement of the cultural preference variable should be addressed. Obviously, other factors must be considered to explain these anomalies.

CHAPTER VIII

CONCLUSIONS:

In this study as well as in the Stebelsky (1994) study, significant regional variations were found to exist in milk consumption and milk production among the republics and oblasts within the RSFSR. Stebelsky (1994) had studied milk production and consumption in the Soviet Union for the year 1988. The methodology used by Stebelsky (1994) was replicated in this study, for the years 1985 and 1989, allowing for direct comparisons and contrasts.

Milk production and consumption in 1985 and 1989 varied greatly among the republics of the Soviet Union and autonomous republics, krays and oblasts within the RSFSR. Based on the stepwise multiple regression, milk consumption, in 1985, was influenced, in order of importance, by retail trade, children (negatively) and cultural preference which accounted for a total of 61.0 percent of the explained variance. In 1989, milk consumption was influenced by urban population, milk production and retail trade accounting for 60.7 of the explained variance with urban population being more influential than milk production and retail trade. Moreover, retail trade became less important in 1989 than it was in 1985.

From these results, it appeared that people in 1985 who were willing to pay, consumed more milk and those who could afford milk also culturally preferred it. These results are in contrast to Stebelsky's (1994), study for the year 1988, as workers, retail trade, urban population and milk production are shown to be related to milk consumption. However, the 1989 results resemble Stebelsky's findings for 1988, as the urban proletariat again enjoyed higher levels of milk consumption. By 1989 it appeared that government authorities were targeting the core urban populations for preferred milk allocation. This may have further discontented the periphery and compounded the core-periphery tensions which eventually led to the demise of the Soviet Union.

This study has attempted to fill certain gaps in the literature pertaining to milk production and consumption in the former Soviet Union, among the republics and oblasts within the RSFSR. First, this study examined milk production and consumption and computed milk balances for the years 1985 and 1989. Second, multiple regression was used to identify significant factors which influenced milk consumption in both 1985 and 1989 and compared them with Stebelsky's (1994) analysis of 1988 data. This study pertained to the situation as it existed in the Soviet

Union. Perhaps, if subsequent data are published for the early 1990s, a study such as this one could be conducted to examine what happened to the milk allocation patterns after the demise of the Soviet Union.

APPENDIX A.

Area and Population Indicators for the RSFSR, 1989

OBLAST	AREA 1000s per km	POPULATION in 1000s	DENSITY per sq. km
Northern	**1451**	**6093**	**4.2**
Archangel O.	587	1570	2.7
Vologda O.	146	1354	9.3
Murmansk O.	145	1146	7.9
Karelian ASSR	172	792	4.6
Komi ASSR	416	1263	3.0
Northwest	**201**	**8279**	**41.1**
Leningrad O.	86	1659	77.8
Novgorod O.	55	753	13.6
Pskov O.	55	847	15.3
Central	**486**	**30379**	**62.6**
Bryansk O.	35	1475	42.3
Vladimir O.	29	1654	57.0
Ivanovo O.	24	1317	55.1
Kalinin O.	84	1670	19.9
Kaluga O.	30	1067	35.7
Kostroma O.	60	809	13.5
Moscow O.	47	6686	333.0
Orel O.	25	891	36.1
Ryazan O.	40	1346	34.0
Smolensk O.	50	1158	23.3
Tula O.	26	1868	72.7
Yaroslavl O.	36	1471	40.4
Volga-Vyatka	**263**	**8457**	**32.1**
Gorky O.	75	3713	49.6
Kirov O.	121	1694	14.0
Mari ASSR	23	750	32.3
Mordvinian ASSR	26	964	36.8

Central Black	**167**	**7741**	**46.2**
Belgorod O.	27	1381	50.9
Voronezh O.	52	2470	47.1
Kursk O.	30	1339	44.9
Liptesk O.	24	1231	51.1
Tambov O.	34	1320	38.5
Volga	**680**	**16411**	**30.6**
Astrakhan O.	44	998	22.6
Volgograd O.	114	2593	22.8
Kuybyshev O.	54	3266	60.9
Penza O.	43	1502	34.9
Saratov O.	100	2690	26.8
Ulyanovsk O.	37	1400	37.5
Kalmyk ASSR	76	322	4.2
Tatar ASSR	68	3640	53.5
N. Caucasus	**356**	**16737**	**47.1**
Krasnodar Kray	84	5115	61.2
Stavropol Kray	81	2855	35.4
Rostov O.	101	4304	42.7
Dagestan ASSR	50	1792	35.6
Kabard.-B. ASSR	13	760	60.8
N. Osetian ASSR	8	634	79.2
Chechen-I. ASSR	19	1277	66.2
Urals	**681**	**20287**	**24.6**
Kurgan O.	71	1105	15.6
Orenburg O.	124	2174	17.5
Perm O.	161	3100	19.3
Sverdloovsk O.	195	4721	24.2
Chelyabinsk O.	88	3626	41.3
Bashkir ASSR	144	3952	27.5
Udmurt ASSR	42	1609	38.2

W. Siberia	**2428**	**15003**	**6.2**
Altay Kray	262	2822	10.8
Kemerovo O.	96	3175	33.2
Novosibirsk O.	178	2782	15.6
Omsk O.	140	2140	15.3
Tomsk O.	317	1001	3.2
Tyumen O.	1435	3083	2.1
E. Siberia	**4124**	**915**	**2.2**
Krasnoyarsk Kray	2402	3595	1.5
Irkutsk O.	768	2831	3.7
Chita O.	432	1378	3.2
Buryat ASSR	351	1042	3.0
Tuva ASSR	171	309	1.8
Far East	**6216**	**7941**	**1.3**
Maritime Kray	166	2260	13.6
Khabarovsk Kray	825	1824	2.2
Amur O.	364	1058	2.9
Kamchatka O.	472	466	1.0
Magadan O.	1199	543	0.5
Sakhalin O.	87	709	8.1
Yakut ASSR	3103	1071	0.3
Kaliningrad O.	**15**	**871**	**57.7**

APPENDIX B. Cultural Preference Index

CULTURAL PREFERENCE OF MILK INDEX
for each Union Republic and/or cultural group

Ethnic Region	**Milk Presence Ratio**	**Index Value Out of 1.00**
Baltic Republics	17/20	0.85
Central Asian Republics	6/20	0.30
Russian Republic	12/20	0.60
Transcaucasian Republics	9/20	0.45
Ukraine, Byelarus, Moldova	13/20	0.65

APPENDIX C. Data Set, 1985

	CODE	MILKCO85	MILKPR85	TRADE85	URBAN85	CHILDREN	CULTURE	CPSU
1	A03	489.00	820.00	1733.00	71.00	237.00	0.85	4.04
2	A02	455.00	749.00	1636.00	71.00	227.00	0.85	7.00
3	A01	409.00	829.00	1393.00	66.00	241.00	0.85	1.45
4	A04	341.00	585.00	1210.00	79.00	235.00	0.59	0.00
5	B01	359.00	243.00	1290.00	75.00	266.00	0.59	2.02
6	B02	379.00	560.00	1178.00	63.00	245.00	0.60	1.52
7	B04	397.00	58.00	1323.00	92.00	273.00	0.58	0.99
8	B07	341.00	207.00	1333.00	81.00	256.00	0.62	4.02
9	B08	356.00	173.00	1488.00	74.00	279.00	0.63	2.62
10	B03	407.00	572.00	1661.00	65.00	198.00	0.60	7.08
11	B05	320.00	467.00	1156.00	70.00	223.00	0.60	1.37
12	B06	368.00	782.00	1113.00	60.00	210.00	0.60	1.19
13	C01	329.00	526.00	1051.00	64.00	229.00	0.60	0.00
14	C02	355.00	312.00	1109.00	78.00	223.00	0.60	1.26
15	C03	313.00	273.00	1146.00	81.00	211.00	0.60	0.76
16	C04	316.00	505.00	1119.00	71.00	209.00	0.60	1.22
17	C05	297.00	556.00	1087.00	67.00	222.00	0.59	1.97
18	C06	375.00	435.00	1232.00	67.00	226.00	0.60	1.26
19	C07	424.00	287.00	2613.00	79.00	198.00	0.60	64.67
20	C08	321.00	749.00	1083.00	61.00	211.00	0.60	2.26
21	C09	323.00	674.00	1087.00	63.00	203.00	0.60	0.74
22	C10	318.00	686.00	1143.00	66.00	223.00	0.60	1.77
23	C11	316.00	389.00	1122.00	80.00	198.00	0.60	1.06
24	C12	368.00	354.00	1155.00	80.00	214.00	0.60	1.40
25	D01	362.00	364.00	1192.00	77.00	216.00	0.60	0.81
26	D02	307.00	517.00	1079.00	68.00	241.00	0.59	1.21
27	D03	294.00	456.00	994.00	60.00	271.00	0.67	2.81
28	D04	330.00	580.00	992.00	55.00	236.00	0.66	1.02
29	D05	302.00	385.00	1010.00	54.00	270.00	0.38	0.76
30	E01	292.00	648.00	1052.00	59.00	228.00	0.60	1.53
31	E02	298.00	548.00	1040.00	59.00	207.00	0.59	0.40
32	E03	338.00	737.00	1059.00	55.00	216.00	0.60	1.45
33	E04	313.00	520.00	1080.00	62.00	215.00	0.60	1.64
34	E05	325.00	584.00	1004.00	54.00	211.00	0.60	2.20
35	F01	321.00	181.00	1101.00	69.00	261.00	0.51	1.08
36	F02	319.00	392.00	1101.00	63.00	233.00	0.58	0.80
37	F03	349.00	306.00	1095.00	80.00	236.00	0.57	0.96
38	F04	349.00	539.00	1038.00	60.00	225.00	0.59	1.33
39	F05	380.00	491.00	1097.00	74.00	233.00	0.59	0.39
40	F06	352.00	460.00	1104.00	69.00	210.00	0.54	1.56
41	F07	306.00	445.00	1041.00	62.00	267.00	0.43	0.52
42	F08	307.00	289.00	999.00	42.00	322.00	0.44	6.64
43	F09	313.00	407.00	1078.00	70.00	254.00	0.43	0.58
44	G01	285.00	407.00	1146.00	53.00	237.00	0.58	0.61
45	G02	319.00	383.00	1140.00	53.00	259.00	0.54	0.77

46	G03	309.00	362.00	1108.00	71.00	229.00	0.58	0.48
47	G04	242.00	186.00	699.00	43.00	363.00	0.70	0.60
48	G05	340.00	335.00	1000.00	60.00	296.00	0.47	1.45
49	G06	401.00	274.00	994.00	71.00	267.00	0.39	3.33
50	G07	281.00	198.00	686.00	42.00	338.00	0.48	0.85
51	H01	355.00	710.00	1104.00	53.00	258.00	0.58	1.84
52	H02	336.00	544.00	1029.00	64.00	266.00	0.54	0.95
53	H03	320.00	260.00	1141.00	76.00	255.00	0.58	0.33
54	H04	371.00	211.00	1189.00	86.00	246.00	0.59	0.44
55	H05	330.00	283.00	1146.00	82.00	250.00	0.54	0.57
56	H06	308.00	370.00	1093.00	69.00	273.00	0.65	1.32
57	I01	347.00	649.00	1171.00	55.00	264.00	0.59	1.12
58	I02	346.00	256.00	1297.00	88.00	251.00	0.60	0.67
59	I03	338.00	505.00	1134.00	73.00	249.00	0.57	0.75
60	I04	334.00	665.00	1176.00	66.00	276.00	0.42	1.01
61	I05	366.00	319.00	1220.00	68.00	271.00	0.59	2.25
62	I06	383.00	298.00	1556.00	72.00	307.00	0.58	0.98
63	J01	345.00	337.00	1332.00	73.00	272.00	0.60	0.92
64	J02	321.00	223.00	1278.00	80.00	283.00	0.59	1.15
65	J03	320.00	265.00	1018.00	64.00	310.00	0.59	0.79
66	J04	278.00	207.00	1180.00	61.00	317.00	0.52	2.15
67	J05	253.00	227.00	1026.00	45.00	373.00	0.60	3.72
68	K01	293.00	156.00	1347.00	78.00	262.00	0.59	1.49
69	K02	320.00	107.00	1374.00	80.00	273.00	0.60	1.24
70	K03	328.00	284.00	1251.00	67.00	290.00	0.41	2.06
71	K04	398.00	148.00	1739.00	82.00	282.00	0.61	5.10
72	K05	416.00	123.00	1854.00	80.00	294.00	0.60	2.04
73	K06	369.00	181.00	1704.00	83.00	272.00	0.59	2.99
74	K07	429.00	251.00	1663.00	68.00	325.00	0.48	2.27
75	L00	399.00	678.00	1221.00	62.00	245.00	0.65	1.34
76	MN0	350.00	452.00	1089.00	65.00	230.00	0.65	1.08
77	P00	294.00	340.00	1033.00	45.00	296.00	0.65	1.25
78	Q00	309.00	131.00	1023.00	54.00	263.00	0.45	0.79
79	R00	293.00	143.00	687.00	54.00	347.00	0.45	0.64
80	S00	433.00	163.00	945.00	68.00	320.00	0.45	1.93
81	T00	260.00	299.00	984.00	57.00	337.00	0.30	1.66
82	U00	180.00	134.00	736.00	42.00	429.00	0.30	0.80
83	V00	182.00	192.00	801.00	40.00	395.00	0.30	1.09
84	W00	152.00	120.00	648.00	34.00	451.00	0.30	1.50
85	X00	168.00	108.00	791.00	47.00	427.00	0.30	1.73

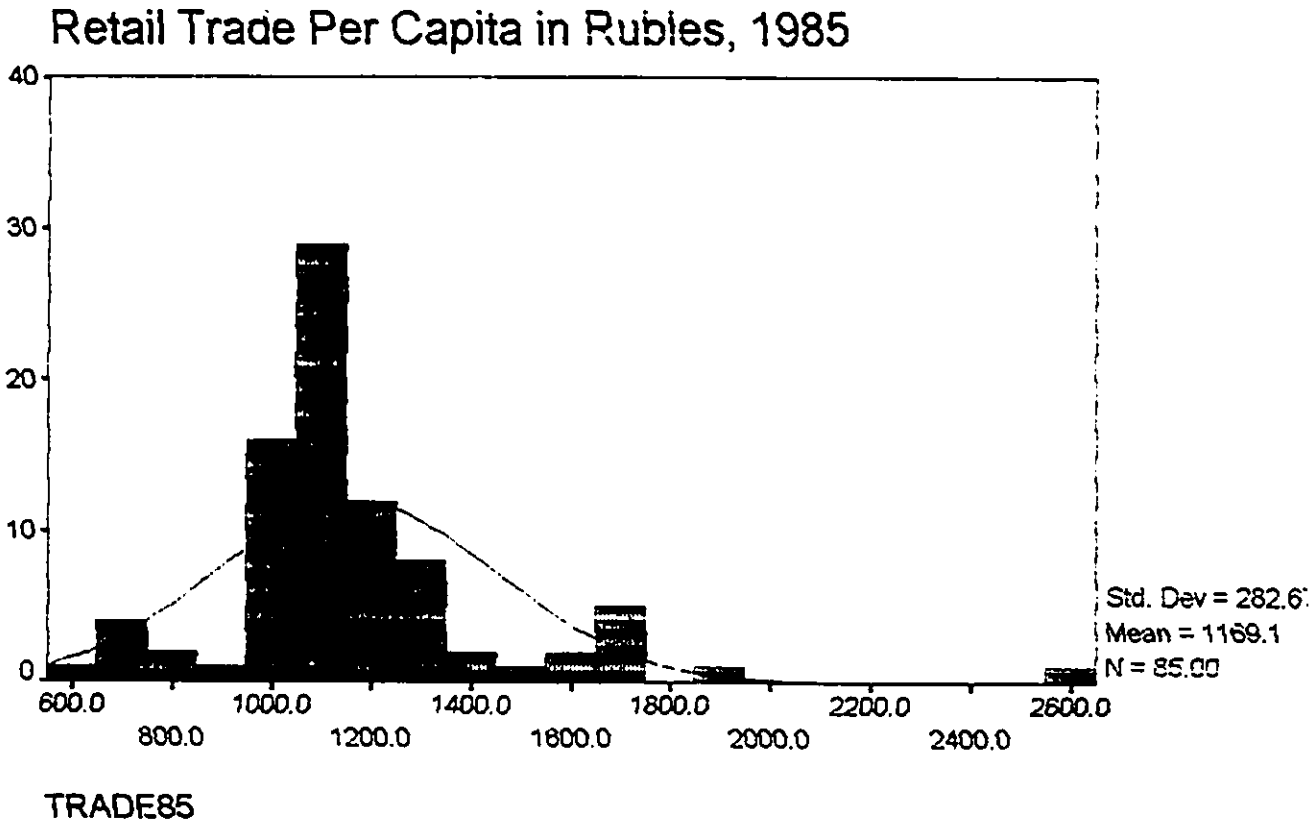
APPENDIX D. Data Set, 1989

	CODE	MILKCO89	MILKPR89	TRADE89	URBAN89	CHILDREN	CULTURE	CRST
1	A03	508.00	810.00	2164.00	72.00	237.00	0.85	4.04
2	A02	457.00	737.00	2055.00	71.00	227.00	0.85	7.00
3	A01	454.00	873.00	1803.00	68.00	241.00	0.85	1.45
4	A04	392.00	595.00	1461.00	79.00	235.00	0.59	0.00
5	B01	384.00	246.00	1496.00	73.00	266.00	0.59	2.02
6	B02	414.00	540.00	1388.00	65.00	245.00	0.60	1.52
7	B04	423.00	70.00	1580.00	92.00	273.00	0.58	0.99
8	B07	402.00	210.00	1633.00	82.00	256.00	0.62	4.02
9	B08	422.00	174.00	1787.00	76.00	279.00	0.63	2.62
10	B03	427.00	595.00	2045.00	66.00	198.00	0.60	7.08
11	B05	343.00	462.00	1398.00	70.00	223.00	0.60	1.37
12	B06	370.00	722.00	1292.00	63.00	210.00	0.60	1.19
13	C01	386.00	560.00	1266.00	67.00	229.00	0.60	0.00
14	C02	389.00	328.00	1292.00	79.00	223.00	0.60	1.26
15	C03	399.00	314.00	1385.00	82.00	211.00	0.60	0.76
16	C04	359.00	535.00	1326.00	71.00	209.00	0.60	1.22
17	C05	373.00	592.00	1284.00	69.00	222.00	0.59	1.97
18	C06	402.00	447.00	1449.00	69.00	226.00	0.60	1.26
19	C07	435.00	314.00	3235.00	79.00	198.00	0.60	64.67
20	C08	421.00	856.00	1331.00	62.00	211.00	0.60	2.26
21	C09	410.00	815.00	1245.00	66.00	203.00	0.60	0.74
22	C10	377.00	682.00	1327.00	68.00	223.00	0.60	1.77
23	C11	377.00	412.00	1286.00	81.00	198.00	0.60	1.06
24	C12	383.00	350.00	1361.00	82.00	214.00	0.60	1.40
25	D01	398.00	389.00	1400.00	77.00	216.00	0.60	0.81
26	D02	328.00	555.00	1312.00	70.00	241.00	0.59	1.21
27	D03	370.00	529.00	1209.00	61.00	271.00	0.67	2.81
28	D04	444.00	660.00	1206.00	57.00	236.00	0.66	1.02
29	D05	389.00	435.00	1241.00	58.00	270.00	0.38	0.76
30	E01	380.00	723.00	1247.00	63.00	228.00	0.60	1.53
31	E02	393.00	621.00	1216.00	61.00	207.00	0.59	0.40
32	E03	352.00	714.00	1232.00	58.00	216.00	0.60	1.45
33	E04	375.00	602.00	1312.00	63.00	215.00	0.60	1.64
34	E05	381.00	643.00	1196.00	56.00	211.00	0.60	2.20
35	F01	384.00	209.00	1302.00	68.00	261.00	0.51	1.08
36	F02	397.00	444.00	1321.00	76.00	233.00	0.58	0.80
37	F03	389.00	332.00	1352.00	81.00	236.00	0.57	0.96
38	F04	419.00	610.00	1237.00	62.00	225.00	0.59	1.33
39	F05	456.00	558.00	1273.00	74.00	233.00	0.59	0.39
40	F06	402.00	485.00	1334.00	71.00	210.00	0.54	1.56
41	F07	385.00	482.00	1209.00	64.00	267.00	0.43	0.52
42	F08	376.00	331.00	1233.00	46.00	322.00	0.44	6.64
43	F09	383.00	460.00	1299.00	73.00	254.00	0.43	0.58
44	G01	303.00	415.00	1392.00	54.00	237.00	0.58	0.61
45	G02	393.00	436.00	1353.00	54.00	259.00	0.54	0.77

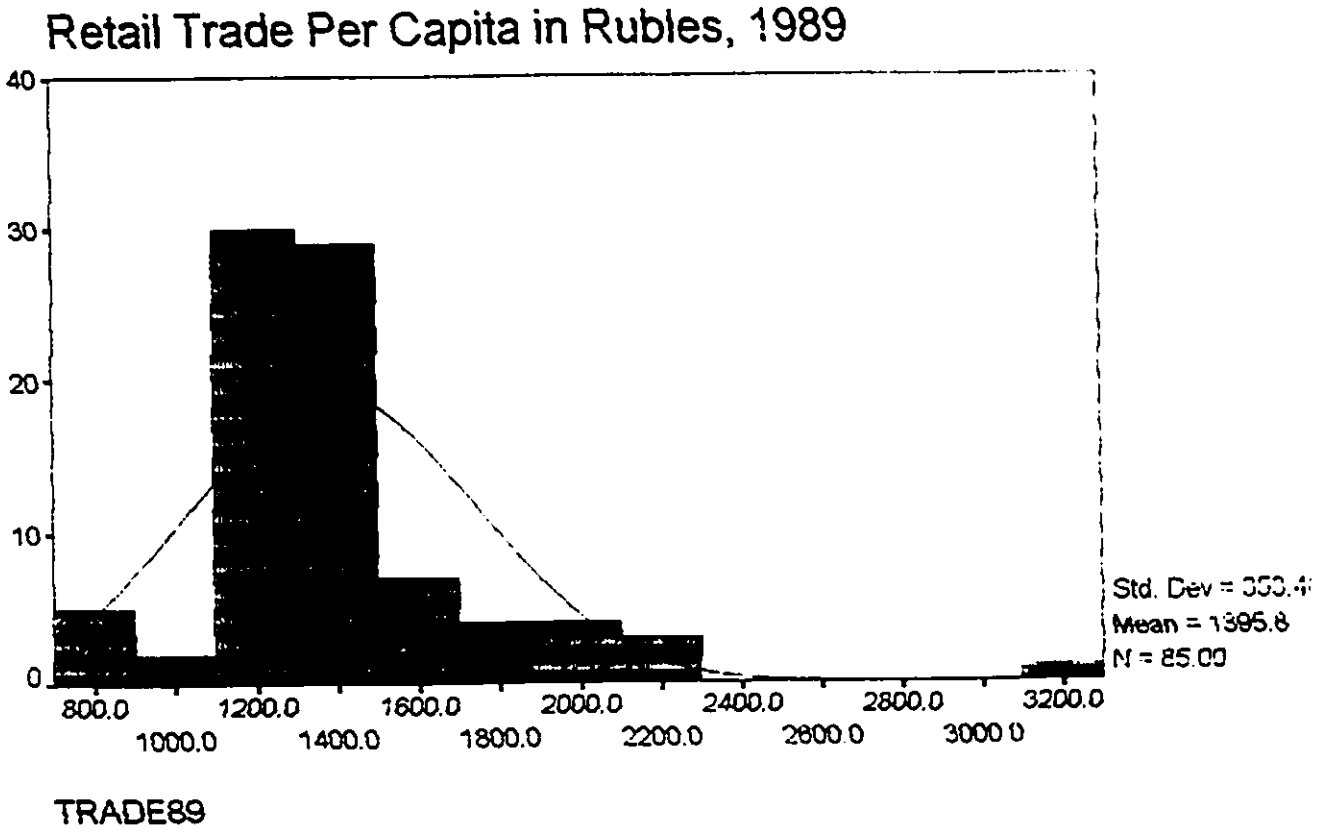
46	G03	333.00	376.00	1287.00	71.00	229.00	0.58	0.48
47	G04	294.00	206.00	851.00	44.00	363.00	0.70	0.60
48	G05	425.00	375.00	1191.00	61.00	296.00	0.47	1.45
49	G06	343.00	254.00	1204.00	69.00	267.00	0.39	3.33
50	G07	324.00	214.00	818.00	41.00	338.00	0.48	0.85
51	H01	416.00	790.00	1305.00	55.00	258.00	0.58	1.84
52	H02	409.00	603.00	1204.00	65.00	266.00	0.54	0.95
53	H03	372.00	272.00	1322.00	77.00	255.00	0.58	0.33
54	H04	425.00	236.00	1409.00	87.00	246.00	0.59	0.44
55	H05	377.00	300.00	1367.00	83.00	250.00	0.54	0.57
56	H06	369.00	399.00	1296.00	70.00	273.00	0.65	1.32
57	I01	407.00	723.00	1371.00	56.00	264.00	0.59	1.12
58	I02	411.00	280.00	1528.00	87.00	251.00	0.60	0.67
59	I03	409.00	545.00	1412.00	75.00	249.00	0.57	0.75
60	I04	437.00	704.00	1400.00	68.00	276.00	0.42	1.01
61	I05	437.00	389.00	1393.00	69.00	271.00	0.59	2.25
62	I06	423.00	276.00	1835.00	76.00	307.00	0.58	0.98
63	J01	406.00	374.00	1560.00	73.00	272.00	0.60	0.92
64	J02	387.00	269.00	1515.00	81.00	283.00	0.59	1.15
65	J03	441.00	325.00	1217.00	65.00	310.00	0.59	0.79
66	J04	372.00	261.00	1432.00	62.00	317.00	0.52	2.15
67	J05	321.00	246.00	1193.00	47.00	373.00	0.60	3.72
68	K01	363.00	178.00	1736.00	77.00	262.00	0.59	1.49
69	K02	378.00	140.00	1157.00	78.00	273.00	0.60	1.24
70	K03	382.00	373.00	1518.00	68.00	290.00	0.41	2.06
71	K04	395.00	163.00	1998.00	81.00	282.00	0.61	5.10
72	K05	424.00	136.00	2227.00	81.00	294.00	0.60	2.04
73	K06	436.00	210.00	2106.00	82.00	272.00	0.59	2.99
74	K07	451.00	240.00	1927.00	67.00	325.00	0.48	2.27
75	L00	421.00	725.00	1559.00	65.00	245.00	0.65	1.34
76	MN0	367.00	471.00	1326.00	67.00	230.00	0.65	1.08
77	P00	313.00	356.00	1273.00	47.00	296.00	0.65	1.25
78	Q00	326.00	131.00	1218.00	56.00	263.00	0.45	0.79
79	R00	299.00	149.00	814.00	54.00	347.00	0.45	0.64
80	S00	480.00	149.00	1269.00	68.00	320.00	0.45	1.93
81	T00	305.00	335.00	1168.00	57.00	337.00	0.30	1.66
82	U00	207.00	146.00	825.00	41.00	429.00	0.30	0.80
83	V00	278.00	278.00	963.00	38.00	395.00	0.30	1.09
84	W00	162.00	112.00	730.00	33.00	451.00	0.30	1.50
85	X00	200.00	118.00	956.00	45.00	427.00	0.30	1.73

APPENDIX E. Histograms

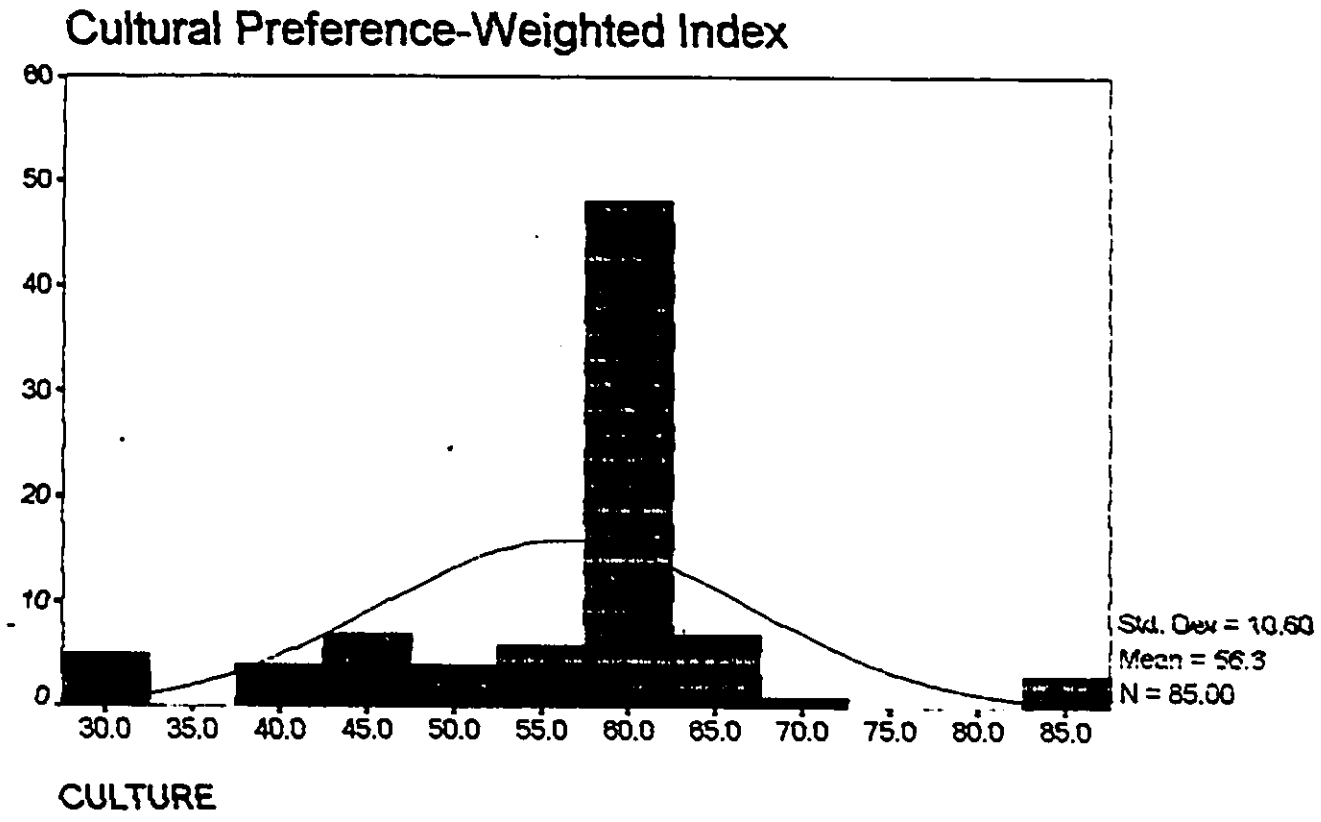
Retail Trade Per Capita in Rubles, 1985



Retail Trade Per Capita in Rubles, 1989



Cultural Preference-Weighted Index



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